ARC TYPE BTK-19 BENCH TEST KIT

Aircraft Radio Corporation
Boonton, New Jersey

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WARRANTY

Aircraft Radio Corporation (ARC) warrants each item of new equipment manufactured by it to be free from defects in material and workmanship under normal service use for which intended. ARC obligates itself under this warranty to replace or repair (at ARC discretion), at its factory, any ARC equipment, or major unit thereof (excluding vacuum tubes and transistors), which shall within one year after delivery to the original purchaser thereof be returned, transportation charges prepaid, to ARC with a statement from an authorized ARC Distributor or Dealer establishing the date of such delivery, which ARC examination shall disclose to have been defective in manufacture. This warranty shall not apply to any equipment, or major unit thereof, which, in the judgment of ARC, has been repaired or altered in any way so as adversely to affect its performance or reliability, or which has been subject to misuse, negligence or accident. This warranty is in lieu of all other guaranties or warranties express or implied. The obligation and responsibility of ARC for or with respect to defective equipment shall be limited to that expressly provided herein and ARC shall not be liable for consequential or other damage or expense whatsoever therefor or by reason thereof.

ARC reserves the right to make changes in design or additions to or improvements in its equipment without obligation to install such additions or improvements in equipment theretofore manufactured.

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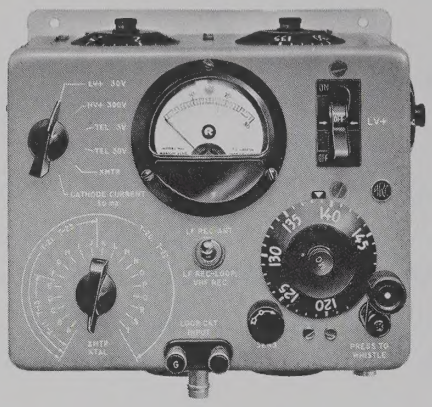
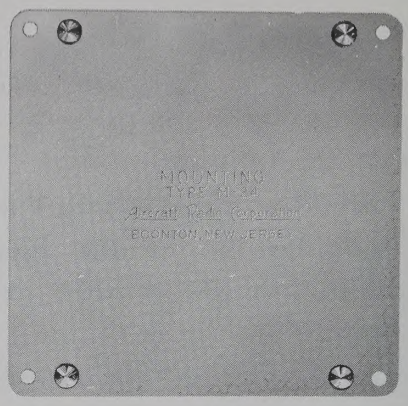
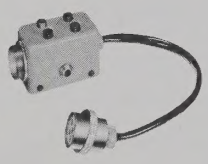


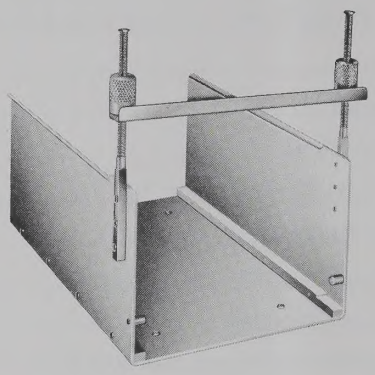
ARC TYPE H-19 TEST UNIT



ARC TYPE M-24 MOUNTING



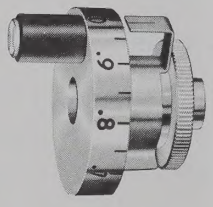
CABLE ASSEMBLY
ARC-20689



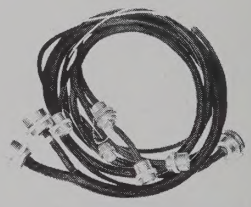
TEST RACK
ARC-16083

CABLE HARNESS ASSEMBLY
ARC-19265

CABLE ASSEMBLY
ARC-11369



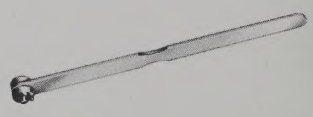
TUNING KNOB
ARC-18802



CABLE HARNESS ASSEMBLY
ARC-19270

MECHANICAL LINKAGE
ARC-16158

TEST PROBE
ARC-16139



WRENCH
ARC-10307

TP1200

Figure 1-1. ARC Type BTK-19 Bench Test Kit

SECTION I
GENERAL INFORMATION

1–1. PURPOSE.

The ARC Type BTK-19 Bench Test Kit is designed to bench test the following units of the ARC Type 12 Equipment: ARC Type K-13 Oscillator-Relay Unit, ARC Type R-10A, R-11A, R-15, R-19, R-20, and R-20A Receivers; and ARC Type T-11B, T-13A, T-20, T-21, T-22, T-23, and T-24A Transmitters. These units may be tested individually or as a receiver-transmitter set.

1–2. UNITS SUPPLIED.

The units supplied as part of the BTK-19 are listed in Table 1–1 and illustrated in Figure 1–1.

TABLE 1–1. UNITS SUPPLIED

Quantity	Unit	ARC Part Number
1	Test Unit ARC Type H-19	19120
1	Cable Harness Assembly	19270
1	Cable Harness Assembly	19265
1	Cable Assembly	20689
2	Cable Assembly	11369 (4 ft)
1	Cable Assembly	11369 (8 ft)
1	Mechanical Linkage	16158 (5 ft)
1	Knob	18802
1	Test Probe	16139
1	Wrench	10307
2	Test Rack	16083
1	Mounting ARC Type M-24	16710
1	Instruction Book	—

1–3. AUXILIARY EQUIPMENT.

The ARC Type BTK-19 Bench Test Kit is intended for use with other test equipment. Suggested test equipment is listed in Table 1–2; however, equivalent test equipment may be substituted.

1–4. MEASUREMENTS AND TESTS.

The ARC Type BTK-19 and the test equipment listed in Table 1–2 can be used for the following measurements, alignments, and tests:

1. Primary input voltage measurement
2. Dynamotor output voltage measurement
3. K-13 Oscillator-Relay Unit test
4. T-11B and T-13A Transmitter alignment and test
5. T-21 and T-23 Transmitter alignment and test
6. T-20 and T-24A Transmitter alignment and test
7. T-22 Transmitter alignment and test
8. R-10A and R-11A Receiver alignment and test
9. R-15 and R-19 Receiver alignment and test
10. R-20 and R-20A Receiver alignment and test
11. General resistance and voltage measurements

TABLE 1–2. AUXILIARY EQUIPMENT

Qty	Name	Type or Characteristics
1	Adapter	UG-201/U
1	Adapter	UG-349/U
1	Attenuator, 6-db	Boonton Radio Corp. Type 505-B
1	Audio Oscillator	Hewlett-Packard Model 200AB
1	Capacity Plate	ARC-15900
6	Crystal, Quartz	Equivalent to ARC-10714; 116, 124, 125, 132, 140, and 148 mc
11	Crystal, Quartz	Equivalent to ARC-16955; 116, 119, 123, 124, 125, 131, 132, 140, 145, 147, and 148 mc
4	Crystal, Quartz	Equivalent to ARC-20456; 119, 121, 124, and 126 mc
1	Dynamotor	ARC Type D-10A Dynamotor, 14 or 28 volts, as required
1	Headset	High-impedance (minimum 5000 ohms)
1	Microphone, Carbon	ARC-11937 (Telephonics Type RS-38A)
1	Multimeter	Simpson Model 260
1	Primary Power Source	14- or 28-volt storage battery or rectifier d-c supply
1	Signal Generator	Ferris Model 16C
1	Signal Generator	Hewlett-Packard Model 608D
1	Voltmeter, Electronic	Ballantine Model 300

1–5. DESCRIPTION OF UNITS.

Test Unit. The ARC Type H-19 Test Unit is the control center and major unit of the BTK-19. It contains the switching and tuning controls, receiver sensitivity control, input and output connectors, test meter, dummy loop circuit, and primary power circuit breaker. Four dial assemblies are included with the H-19 for use with the individual receivers. The dial assembly in use is secured to the tuning mechanism of the H-19 by a captive thumbscrew. The remaining three dial assemblies are attached to the H-19 chassis.

The H-19 is wall-mounted by means of its back cover plate. In this position, the operating controls and test meter are on the front of the chassis; the cable connectors, headset and microphone jacks, and mechanical linkage connector are on the bottom of the chassis. The H-19 may be used to test either 14- or 28-volt equipment.

Cable Harness Assembly ARC-19265. Cable Harness Assembly ARC-19265 is used with the T-20, T-22, and T-24A Transmitters and the R-10A, R-11A, R-15, and R-19 Receivers. It interconnects the H-19, the primary power source, and the units under test. The cable assembly consists of suitable wire lengths terminated in six plug-type connectors, one dummy connector, and two bare, tinned leads which are used to connect the low-voltage source. The cable harness assembly is connected to two 19-pin receptacles on the bottom of the H-19 chassis.

Cable Harness Assembly ARC-19270. Cable Harness Assembly ARC-19270 is used with the K-13 Oscillator-Relay Unit; the T-11B, T-13A, T-21, and T-23 Transmitters; and the R-10A, R-11A, R-15, and R-19 Receivers. It interconnects the H-19, the primary power source, and the units under test. The cable assembly consists of suitable wire lengths terminated in eight plug-type connectors, two dummy connectors, and two bare, tinned leads which are used to connect the low-voltage source. The cable harness assembly is connected to two 19-pin receptacles on the bottom of the H-19 chassis.

Cable Assembly ARC-20689. Cable Assembly ARC-20689 is used with the R-20 and R-20A Receivers. It is connected between the R-20 or R-20A Receiver and Cable Harness Assembly ARC-19270. The cable assembly consists of a 9-inch, 5-conductor cable terminated at one end with an ARC-20764 plug and at the other end in a metal box. Four test jacks, a telephone jack, and a 6-pin receptacle are mounted on the box. The tip jacks are used to test the lamp relay and audio circuits. The telephone jack is used for connecting a headset. The box contains a 300-ohm audio load resistor, and a 4700-ohm resistor in series with the PHONES jack. The series resistor prevents the headset from shunting the audio load resistor and also limits the audio signal applied to the headset.

Cable Assembly ARC-11369. Three ARC-11369 coaxial cable assemblies are supplied. Two of these cable assemblies are 4 feet long and the other is 8 feet long. These cable assemblies are terminated at each end with plug ARC-11337 (UG-88C/U). The 8-foot length is used to interconnect the transmitter and receiver installed in the bench test system. The 4-foot lengths interconnect the transmitter, K-13 Oscillator Relay Unit, and H-19 Test Unit.

Mechanical Linkage Assembly. Mechanical Linkage Assembly ARC-16158 is a 5-foot length of flexible shafting enclosed in a metal casing. It is connected between the H-19 and a tunable receiver to permit remote tuning.

Knob. Knob ARC-18802 is designed for direct tuning of the receiver. It is used in place of Mechanical Linkage ARC-16158 to set the main tuning capacitor accurately. It consists of a crank handle with graduated dial coupled to a spline gear, and an adjustable fiducial mark. The dial graduations are used as a reference for counting the number of dial-turns with relation to the frequency setting of the tuning capacitor. The spline of the knob mates directly with the receiver tuning capacitor spline.

Wrench. Wrench ARC-10307 is a special tool used to align the r-f, mixer, and oscillator trimmer capacitors in the R-10A, R-11A, R-15, and R-19 Receivers.

Test Probe Assembly. Test Probe Assembly ARC-16139 is a coaxial cable terminated at one end with a special plug designed for insertion into the receiver i-f test receptacle. The other end is terminated in a UG-89/U connector for connection to the signal generator used during test procedures.

Test Rack. Test Rack ARC-16083 is a U-shaped framework designed to mount a receiver or transmitter. The receiver or transmitter is secured by a cross-bar (swung away during installation) and two knurled thumbnuts. The test rack is constructed to permit the unit under test to be mounted in a normal or upside-down position. Mounting holes are provided in the base to secure the test rack to the test bench.

Mounting. Mounting ARC Type M-24 is a metal mounting plate which contains four snapslide studs. The K-13 is secured to the M-24 by engaging the four K-13 snapslides with the studs on the M-24. Four holes are provided in the M-24 to secure it to the test bench.

SECTION II
INSTALLATION AND OPERATION

2–1. INSTALLATION CONSIDERATIONS.

The units of the ARC Type BTK-19 Bench Test Kit may be installed in any desired arrangement. For convenient operation, fasten the H-19 to a wall, and the test racks and mounting to the test bench surface. As a precaution, a common ground strap should be connected between the H-19 chassis, test racks, and mounting. Test equipments and instruments may be arranged in any convenient position in the test area.

2–2. CONTROL FUNCTIONS.

The operating controls of the H-19, shown in Figure 2–1, are used for the following functions:

The test meter switch, in the upper left corner of the H-19, provides meter-switching for the following tests:

1. Primary-voltage test (LV+ 30V position)
2. High-voltage test (HV+ 300V position), with the high voltage for the entire system supplied by the D-10A Dynamotor mounted on the receiver
3. Telephone (headset) line audio voltage test across a built-in 300-ohm load (TEL 3V position); a full-scale reading is equivalent to 3 volts
4. Telephone (headset) line audio voltage test across a built-in 300-ohm load (TEL 30V position); a full-scale reading is equivalent to 30 volts
5. Transmitter power output test (XMTR position); the test meter is used to determine transmitter operation, tune the transmitter to resonance, and serve as an indication of normal power output
6. Cathode current test (CATHODE CURRENT 30-ma position); this test measures the receiver cathode current through the sensitivity control

The LV+ switch, in the upper right corner of the control panel, is an on-off, 10-ampere, circuit-breaker switch. It controls the application of primary power to the test system and protects the equipment under test from overloads.

The SENS control, to the left of the frequency dial, adjusts the r-f sensitivity of the receiver under test to the desired value; clockwise rotation increases sensitivity.

The tuning crank, in the bottom right corner of the control panel, remotely tunes the receiver through flexible mechanical linkage. Depressing the tuning crank permits "whistle-through" tuning of the R-15 and R-19 Receivers to any of the associated transmitter crystal frequencies.

The frequency dial, located in the lower right corner of the control panel, indicates the frequency to which the receiver is tuned.

The function of the toggle switch, located in the center of the control panel just below the test meter, depends on the receiver installed in the test system. With an R-15 or R-19, the LF REC-LOOP VHF REC position completes the cathode circuit of the receiver's audio output tube. With an R-10A or R-11A, the same position energizes the receiver's antenna-loop relay; in the LF REC-ANT position, the relay is unenergized.

The crystal selector switch (XMTR XTAL) is in the lower left corner of the control panel. Crystal positions A through E are used when testing and tuning T-11B and T-13A Transmitters. Crystal positions A through J are used when testing and tuning T-21 and T-23 Transmitters. With a T-21 or T-23 installed in the test system, crystal positions A, B, C, D, and E select crystals 1, 3, 5, 7, and 9, respectively; crystal positions F, G, H, I, and J select crystals 2, 4, 6, 8, and 10, respectively. The T-21 or T-23 crystal selector relay is automatically actuated when the crystal selector switch is in crystal positions F through J. Crystal positions A through T are used when testing and tuning T-20, T-22, and T-24A Transmitters. With any of these transmitters installed in the test system, crystal positions A through J select low-band crystals 1 through 10, respectively, and crystal positions K through T select high-band crystals 11 through 20, respectively. Band selection is accomplished automatically by the crystal selector switch.

Two binding posts (LOOP CKT INPUT), at the bottom center of the control panel, are connected to a dummy loop circuit within the H-19. The dummy loop circuit is used during alignment and test of R-10A and R-11A Receivers to convert the r-f output of a signal generator to a simulated signal such as would be picked up by an ARC Type L-10A Loop antenna. The output of the signal generator is connected to the binding posts (low side to binding post G) and the output of the dummy loop circuit is taken from the LF REC connector on the bottom of the H-19 Test Unit.

2–3. INTERCABLING CONNECTIONS.

Figure 2–2 is an intercabling diagram illustrating the required interconnections between the H-19 Test Unit; T-11B, T-13A, T-21, or T-23 Transmitter; R-10A, R-11A, R-15, or R-19 Receiver; and the K-13 Oscillator-Relay Unit. The wiring between the receptacles of the H-19 and the receptacles of the units under test is shown in Figure 2–3. Figure 2–4 is an intercabling diagram illustrating the required interconnections between the H-19 Test Unit; T-20, T-22, or T-24A Transmitter; and the R-10A, R-11A, R-15, or R-19 Receiver. The wiring between the receptacles of the H-19 and the receptacles of the units under test is shown in Figure 2–5. With the exception of the signal generator connections, all cable, mechanical linkage, headset, and microphone connections are made at the underside of the H-19. Two binding posts, on the front panel of the test unit, are provided for signal generator connections when testing or aligning R-10A and R-11A Receivers. The XMTR connector is a 50-ohm dummy load which terminates the r-f output of the transmitter under test.

2–4. PRELIMINARY PROCEDURE.

To prepare the BTK-19 for operation and testing, proceed as follows:

Step 1. Install a receiver with dynamotor and a transmitter in the test racks. If an R-20 or R-20A Receiver is to be tested, install it in the test rack normally used to mount the transmitter. If whistle-through tests with the T-11B or T-13A are to be made, mount a K-13 Oscillator-Relay Unit on the M-24 Mounting.

Caution

To prevent damage to the units installed in the test system, all units must have the same low-voltage rating.

Step 2. Interconnect the H-19 and the units under test with Cable Harness Assembly ARC-19265 (Figure 2–4) or Cable Harness Assembly ARC-19270 (Figure 2–2), as applicable.

Step 3. Depending on the voltage rating of the equipment under test, connect the two bare, tinned leads of the cable harness assembly to a 14- or 28-volt dc primary power source.

Note

Observe polarity when connecting the primary power source. The two bare, tinned leads have polarity identification tags attached.

Step 4. If the test system is being prepared to perform a transmitter test, a K-13 Oscillator-Relay Unit test, or an R-20 or R-20A Receiver test, proceed as follows (for other tests, continue with Step 5):

a. Interconnect the H-19 and the receiver's main tuning capacitor spline with Mechanical Linkage ARC-16158. Rotate the H-19 tuning crank counterclockwise as far as it will go. Do not force the receiver tuning capacitor past its stop.

b. Select the proper dial assembly and without disturbing the setting of the tuning crank, secure it to the tuning mechanism so that the small dot at the high-frequency end of the dial is aligned with the triangle-shaped fiducial mark. Proceed with Step 6.

Step 5. If the test system is being prepared to test or align an R-10A, R-11A, R-15, or R-19 Receiver, proceed as follows:

a. Fit Knob ARC-18802 over the receiver's main tuning capacitor spline. Rotate the knob counterclockwise until it stops; do not force it beyond the stop point.

b. Without disturbing the receiver's tuning capacitor setting, remove the knob. Orient the knob so that the red zero line is approximately on top (12 o'clock position).

c. Replace the knob, restrain the crank so that the red zero line remains on top and the tuning capacitor does not change position, then tighten the knurled nut on the knob.

d. Rotate the collar on the knob until the black fiducial line is aligned with the red zero line. The number of knob revolutions required for various receiver frequencies is listed in Table 2–1.

Step 6. Connect a headset (high-impedance) and microphone to their respective jacks on the H-19.

Step 7. Set the H-19 test meter switch to the LV+ 30V position, then throw the H-19 LV+ switch to the ON position. Allow approximately 3 minutes for warm-up, then set low-voltage input to 27.5 (or 13.75) volts.

Note

The dynamotor mounted on the receiver supplies high voltage for all units under test. When testing or trouble-shooting units other than the dynamotor, install a dynamotor that is known to be good.

2–5. ALIGNMENT AND TEST PROCEDURES.

The following commercial and military instruction books contain alignment and test procedures for ARC Type 12 Equipment:

Handbook of Maintenance Instructions, Radio Set ARC Type 12; USAF Publication No. T.O. 12R2-4-1-2; USN Publication No. AN 16-45-122

Field Maintenance Instructions, Radio Set ARC Type 12; USAF Publication No. T.O. 12R2-4-1-42

Instruction Book for ARC Type 12 Equipment with UHF Supplement; ARC Publication No. ARCIB-12-3

Instruction Book for ARC Type R-20A Marker Beacon Receiver; ARC Publication No. ARCIB-R20A-2

Preliminary Instruction Book for ARC Type T-20 VHF Transmitter; ARC Publication No. ARCIB-T20-2

Instruction Book for ARC Type T-22 VHF Transmitter; ARC Publication No. ARCIB-T22-2

Reference to these publications and an understanding of the functions of the H-19 controls will facilitate the use of the BTK-19 in performing and completing these procedures. However, since not all of the procedures describe specifically how to use the BTK-19, such instructions are given in Appendix A of this instruction book. Similar information will be included in future revisions of the applicable instruction books.

TABLE 2–1. KNOB REVOLUTIONS *VERSUS* RECEIVER FREQUENCY

Clockwise Revolutions from Minimum-capacitance Setting	Receiver Frequency			
	R-10A	R-11A	R-15	R-19
2.5	–	520 kc	–	–
3.0	1400 kc	–	–	–
4.75	–	–	–	144 mc
5.2	–	–	131 mc	–
14.97	–	–	–	133 mc
15.14	–	–	121 mc	–
15.72	–	330 kc	–	–
15.725	900 kc	–	–	–
25.0	–	–	–	122 mc
25.2	–	–	111 mc	–
26.4	–	210 kc	–	–
26.47	570 kc	–	–	–

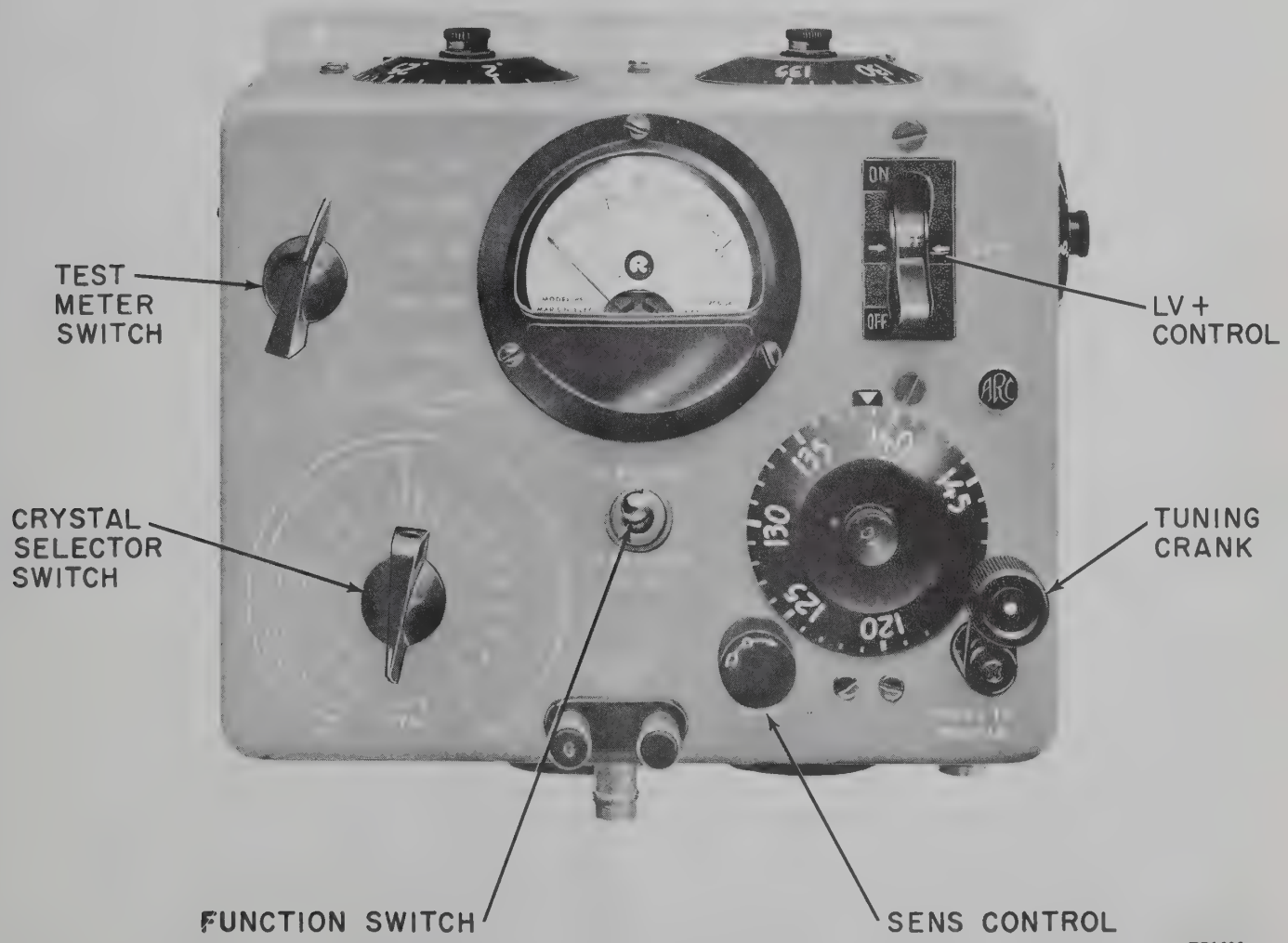
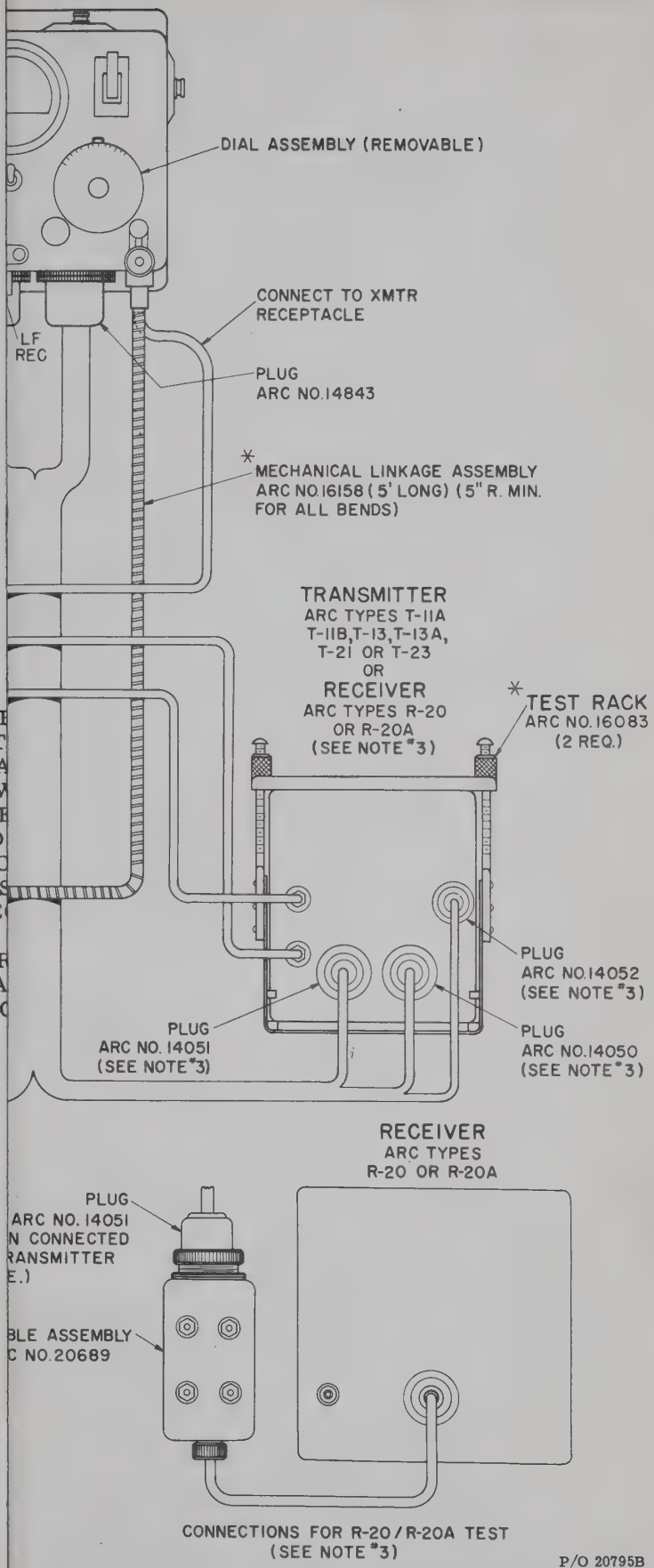


Figure 2–1. ARC Type H-19 Test Unit, Operating Controls

NOTES

NOTES:

1. ONLY THOSE PARTS MAI
   A PART OF BENCH TEST
2. FOR EXTERNAL SCHEMA
3. CONNECTIONS ARE SHOV
   MITTER. TO TEST RECE
   THE TRANSMITTER AND
   THE CABLE HARNESS TO
   ASSEMBLY ARC-20689 AS
4. COAXIAL CABLE CONNE
   MEASUREMENT OF VHF
   AND FOR "WHISTLE THR
   CONNECTIONS (FOR EXA
   SENSITIVITY), REFER TO



re 2–2. *ARC Type BTK-19 Bench Test Kit With T-11B, T-13A, T-21, or T-23 Transmitter, Interconnection Diagram*

NOTES

NOTES:

1. ONLY THOSE PARTS MARKED WITH AN ASTERISK (*) ARE A PART OF BENCH TEST KIT ARC TYPE BTK-19.
2. FOR EXTERNAL SCHEMATIC DIAGRAM SEE FIGURE 2-3.
3. CONNECTIONS ARE SHOWN FOR TESTING A VHF TRANSMITTER. TO TEST RECEIVER R-20 OR R-20A, DISCONNECT THE TRANSMITTER AND CONNECT PLUG ARC-14051 OF THE CABLE HARNESS TO R-20 OR R-20A THROUGH CABLE ASSEMBLY ARC-20689 AS SHOWN.
4. COAXIAL CABLE CONNECTIONS ARE SHOWN FOR MEASUREMENT OF VHF TRANSMITTER POWER OUTPUT AND FOR "WHISTLE THRU" OPERATION. FOR OTHER CONNECTIONS (FOR EXAMPLE, TO MEASURE RECEIVER SENSITIVITY), REFER TO BTK-19 INSTRUCTION BOOK.

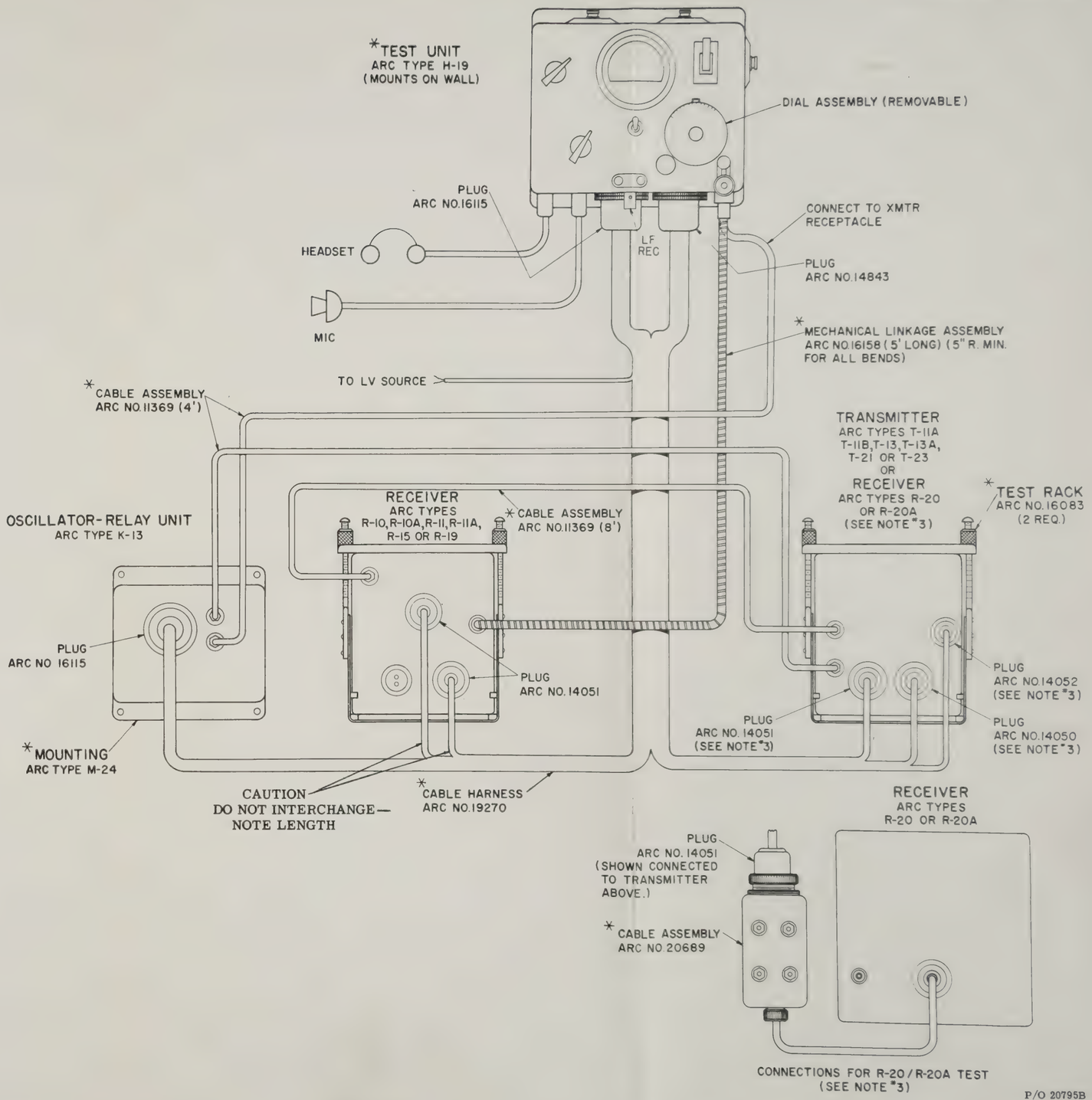
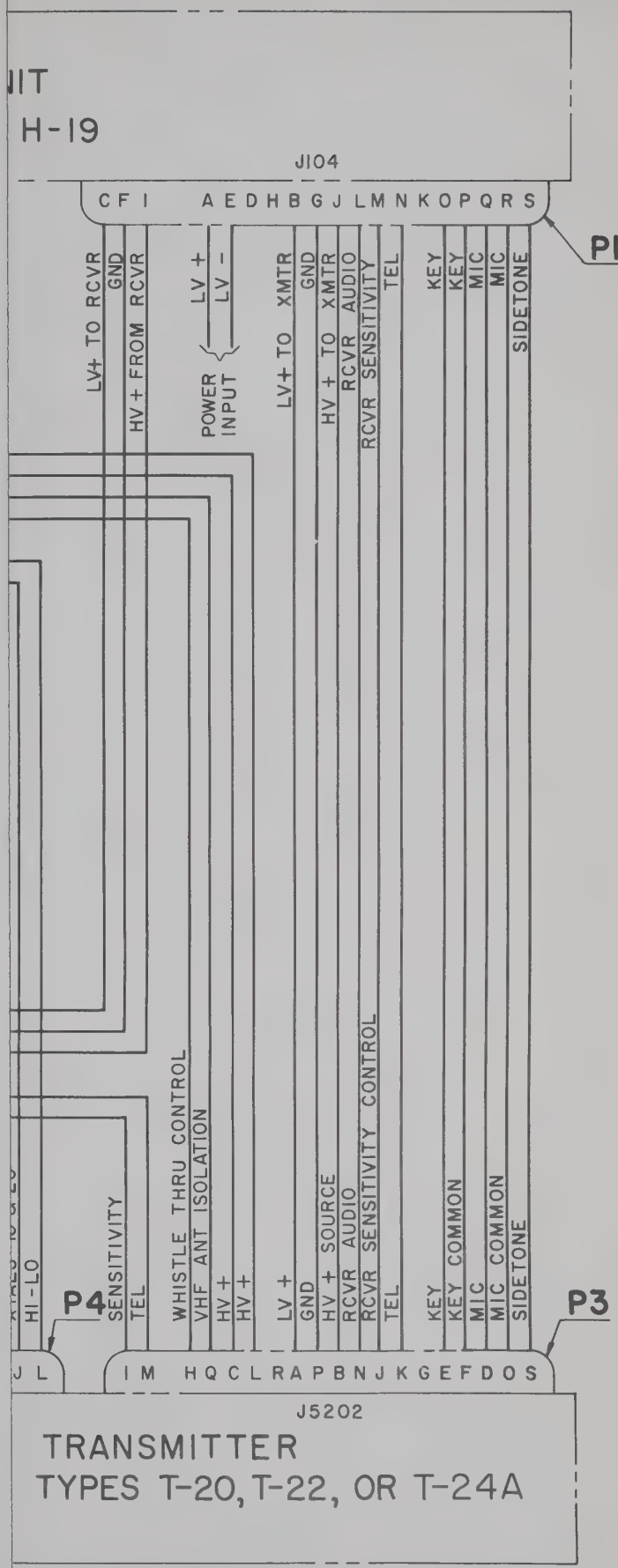
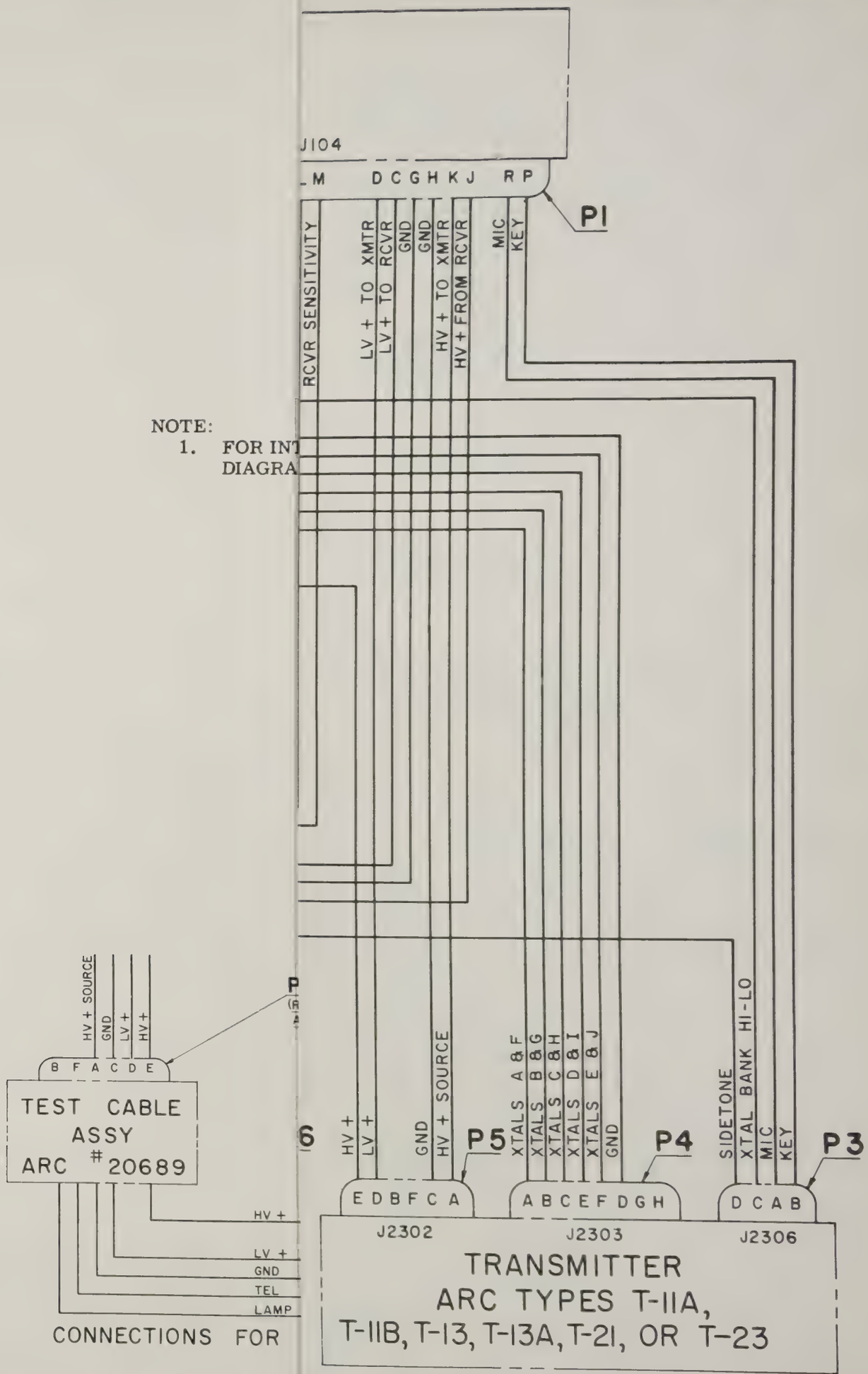


Figure 2–2. ARC Type BTK-19 Bench Test Kit With T-11B, T-13A, T-21, or T-23 Transmitter, Interconnection Diagram

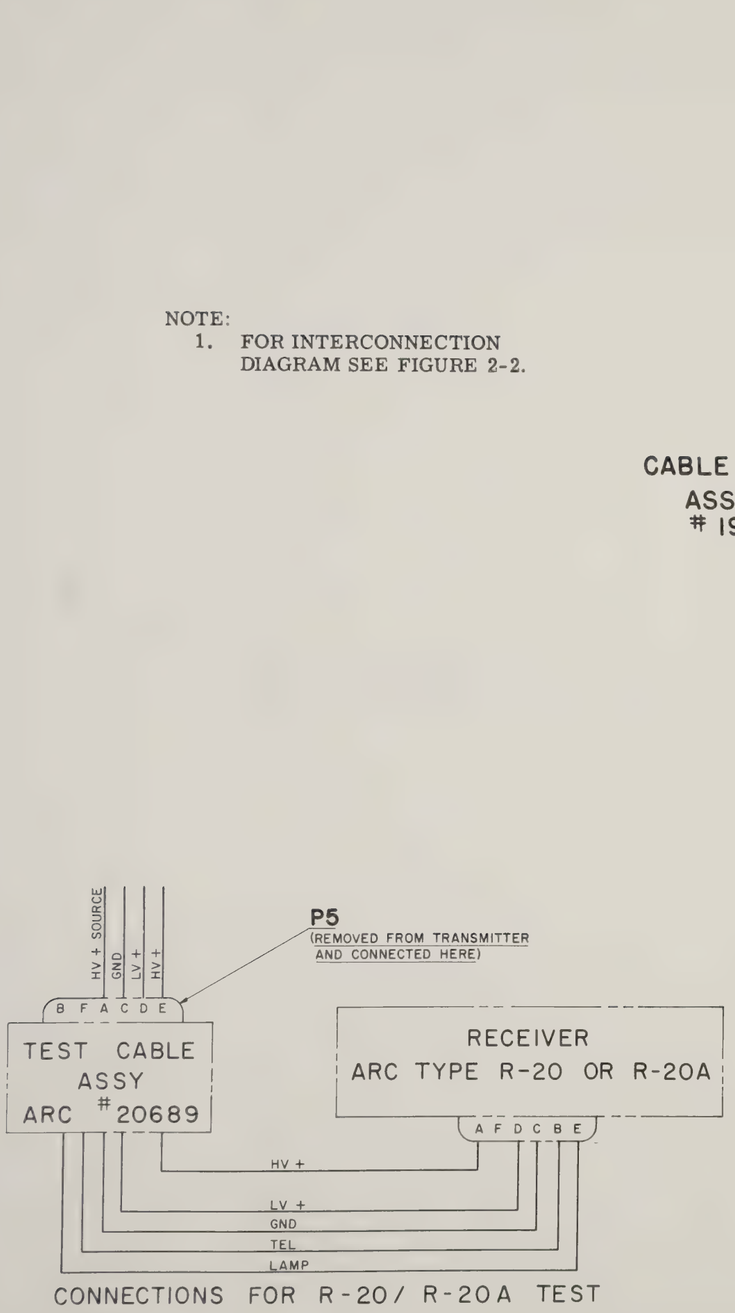


e 2–5. ARC Type BTK-19 Bench Test Kit With T-20, T-22, or T-24A Transmitter, External Schematic Diagram



2–3. *ARC Type BTK-19 Bench Test Kit With T-11B, T-13A, -21, or T-23 Transmitter, External Schematic Diagram*

NOTE:
1. FOR INTERCONNECTION DIAGRAM SEE FIGURE 2-2.



CONNECTIONS FOR R-20/ R-20A TEST

CABLE HARNESS ASSEMBLY # 19270

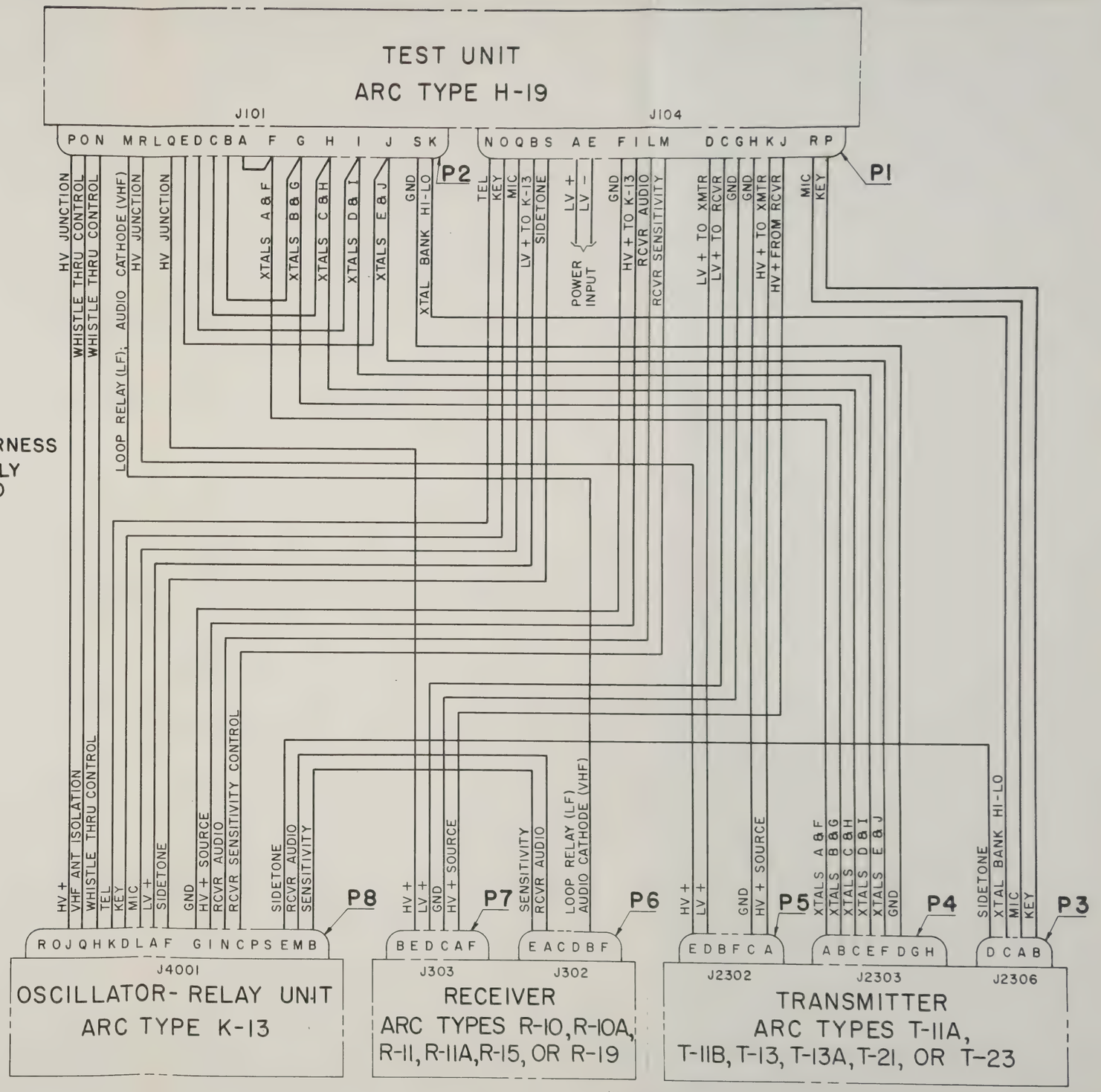


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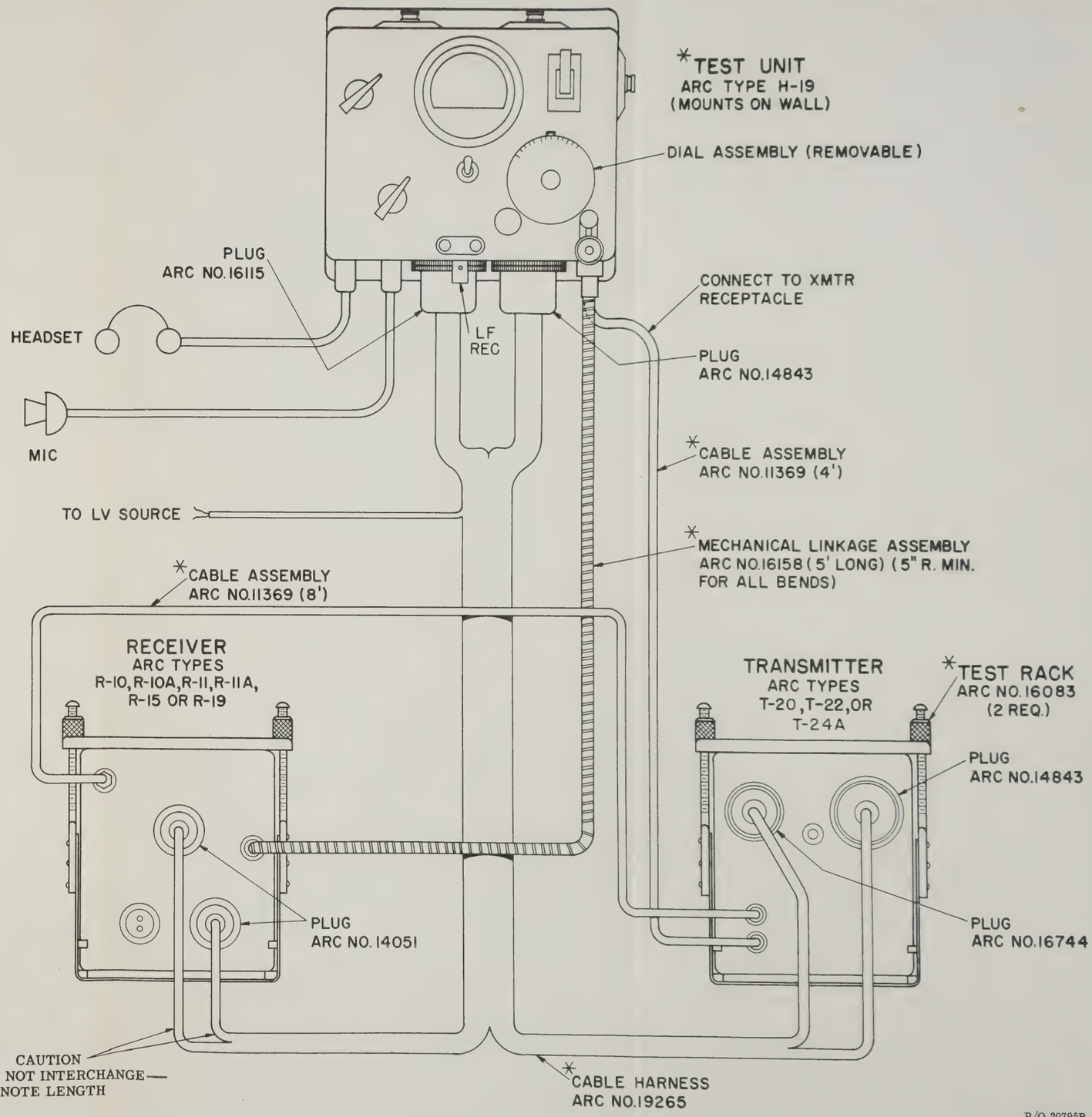
Figure 2–3. ARC Type BTK-19 Bench Test Kit With T-11B, T-13A, T-21, or T-23 Transmitter, External Schematic Diagram

NOTES:

1. ONLY THOSE PARTS MARKED WITH AN ASTERISK (*) ARE A PART OF BENCH TEST KIT ARC TYPE BTK-19.
2. FOR EXTERNAL SCHEMATIC DIAGRAM SEE FIGURE 2-5.

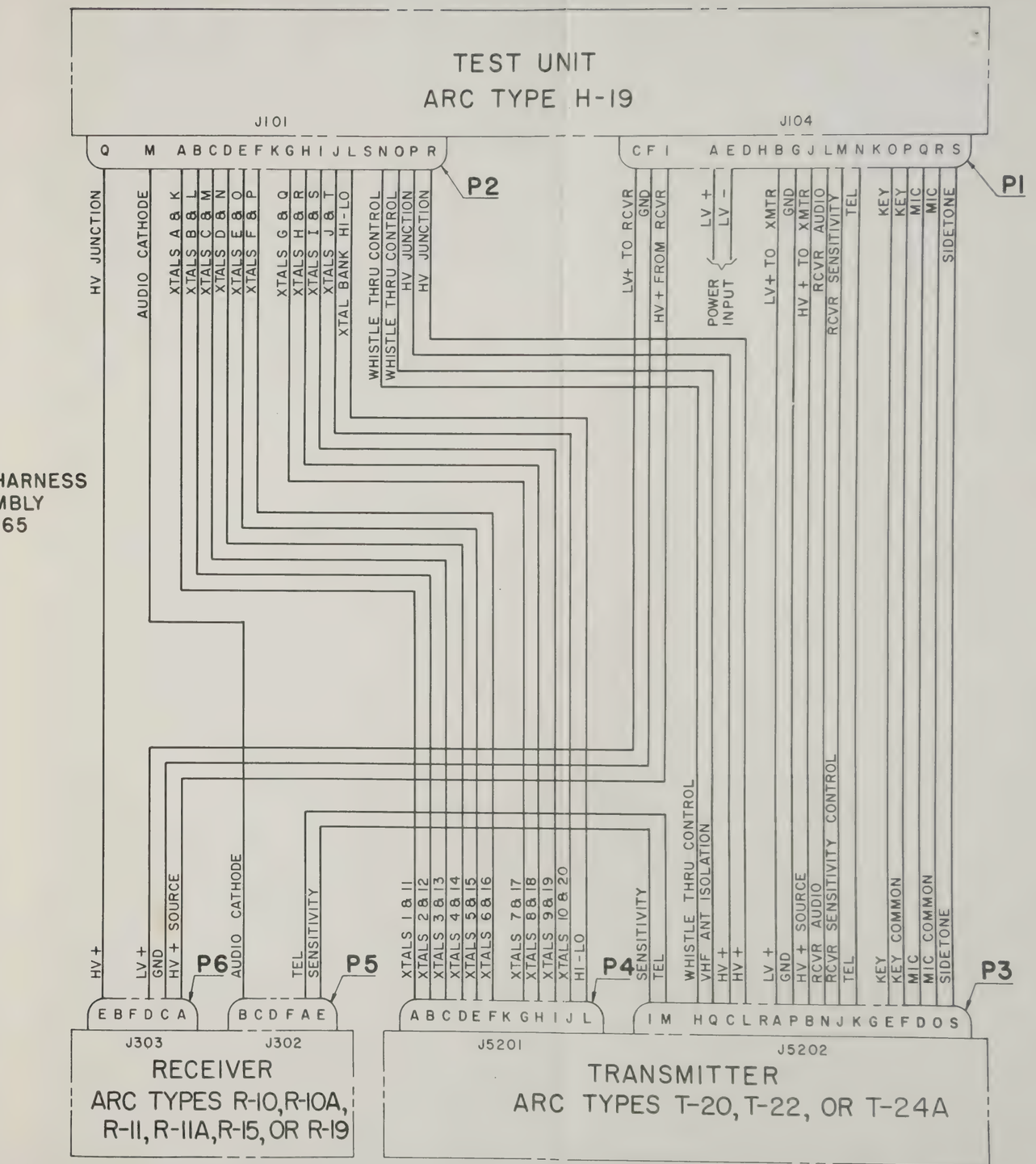


P/O 20795B

Figure 2–4. ARC Type BTK-19 Bench Test Kit With T-20, T-22, or T-24A Transmitter, Interconnection Diagram

CABLE HARNESS
ASSEMBLY
19265

NOTE:
1. FOR INTERCONNECTION DIAGRAM SEE FIGURE 2-4.



P/O 21414B

Figure 2–5. ARC Type BTK-19 Bench Test Kit With T-20, T-22, or T-24A Transmitter, External Schematic Diagram

SECTION III
MAINTENANCE

3–1. GENERAL.

The ARC Type BTK-19 Bench Test Kit does not require special maintenance procedures; however, normal care in handling the bench test kit will promote trouble-free operation of the test system.

The bottom cover of the H-19 Test Unit may be removed for meter calibration and inspection of internal component parts. An interior view of the H-19 is shown in Figure 3–2. Included in this section are schematic and wiring diagrams of the ARC Type H-19 (Figures 3–3 and 3–4) and schematic and wiring diagrams of Cable Assembly ARC-20689 (Figures 3–5 and 3–6).

3–2. PREVENTIVE MAINTENANCE.

A schedule of preventive maintenance will help prevent defective operations. Special checks are not required; however, depending upon the frequency of use, it is suggested that the following inspections be made:

1. Check that all solder connections are mechanically and electrically secure.
2. Check connector pins; corroded or deformed pins may cause intermittent operation.
3. Check the cables and cable harnesses for possible damage to the insulation or wires.
4. Check mechanical linkage casing for sharp bends or breaks. The shafting should rotate freely. Linkage terminations should be secure. In use the linkage should be reasonably straight; do not make any bend-radius less than 5 inches.
5. All panel markings should be legible. Keep the units free of dust, dirt, and grime.
6. Clean the XMTR XTAL and the meter switch contacts with carbon tetrachloride.

3–3. LUBRICATION.

If friction develops in the tuning crank, apply a small amount of Esso Beacon #325 Grease, or equivalent, to the tuning crank bearing surfaces.

If necessary, the mechanical linkage shafting may be lubricated with an anti-seize lubricant. Use "Univis #40" (Standard Oil Company), or equivalent, for this purpose.

3–4. METER CALIBRATION.

The accuracy of the H-19 test meter should be checked from time to time. R106 and R110 in the meter circuit (see Figure 3–3) are used for calibration. If the meter becomes inaccurate, proceed as follows:

Step 1. Connect a 1000-ohm (±1%) resistor to pin M of J104 (see Figure 3–1).

Step 2. Connect a variable d-c voltage supply across the 1000-ohm resistor and the H-19 chassis.

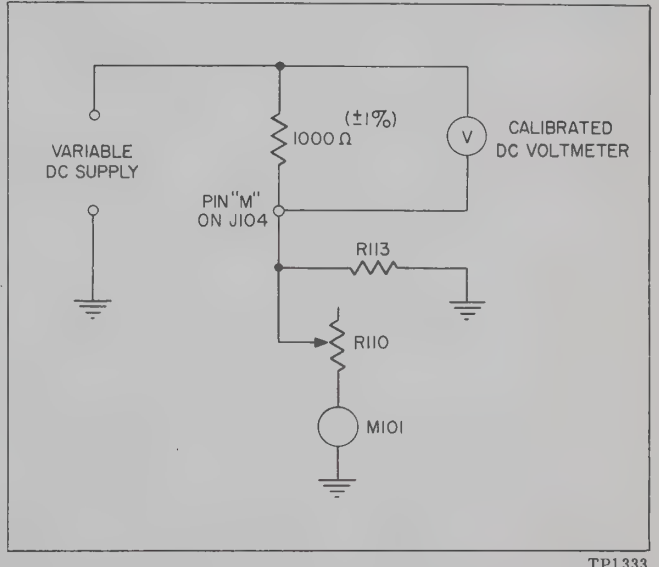
Step 3. Connect a calibrated 20,000 ohm/volt d-c voltmeter across the 1000-ohm resistor.

Step 4. Set the H-19 SENS control to zero ohms.

Step 5. Adjust the d-c voltage supply to produce a 30-volt reading across the 1000-ohm resistor.

Step 6. Adjust R110 until M101 reads 30.

Step 7. Connect 10 volts (2 watts) of vhf transmitter power to J103. Adjust R106 until M101 reads 20.

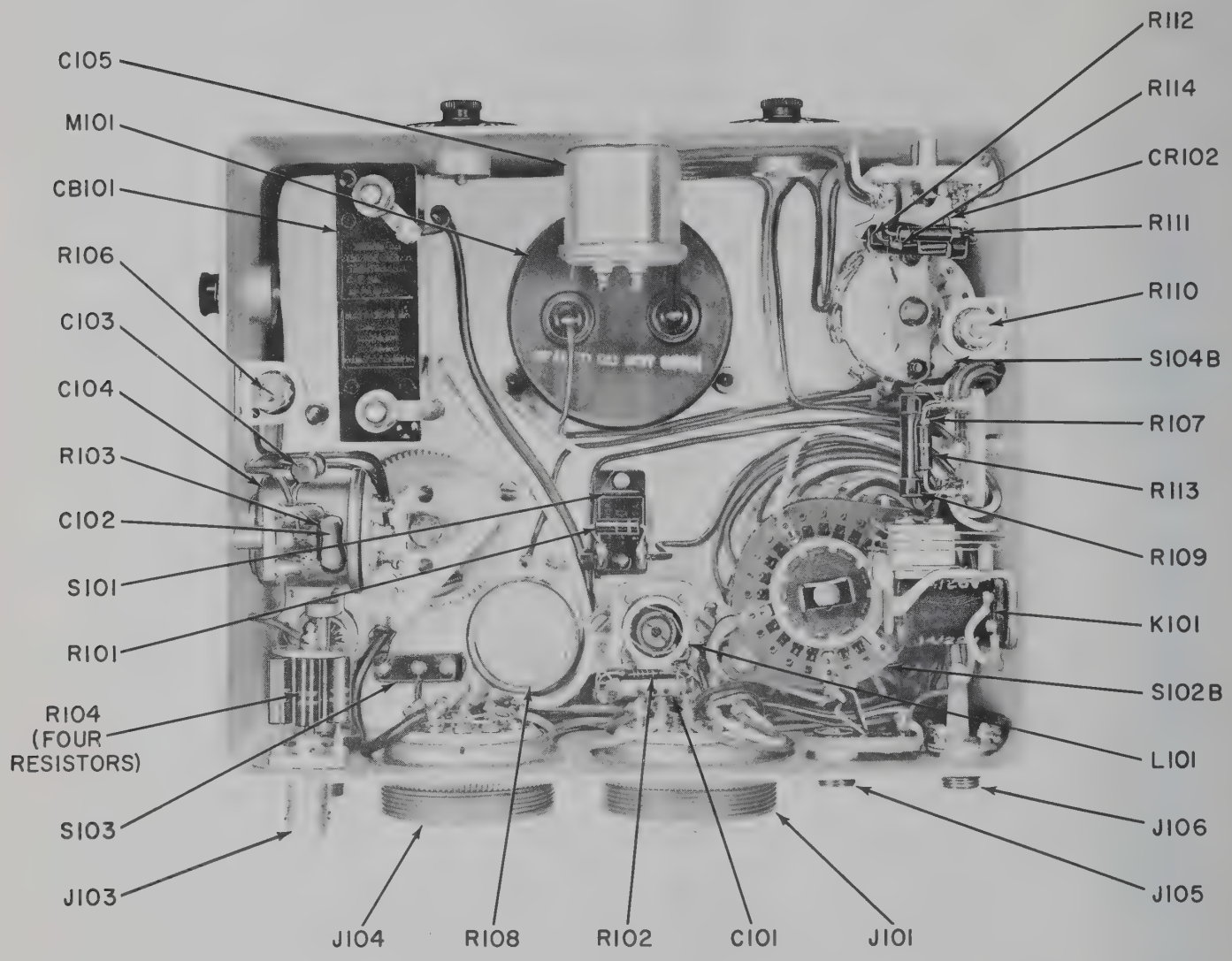


TP1333

Figure 3–1. Meter Calibration, Schematic Diagram

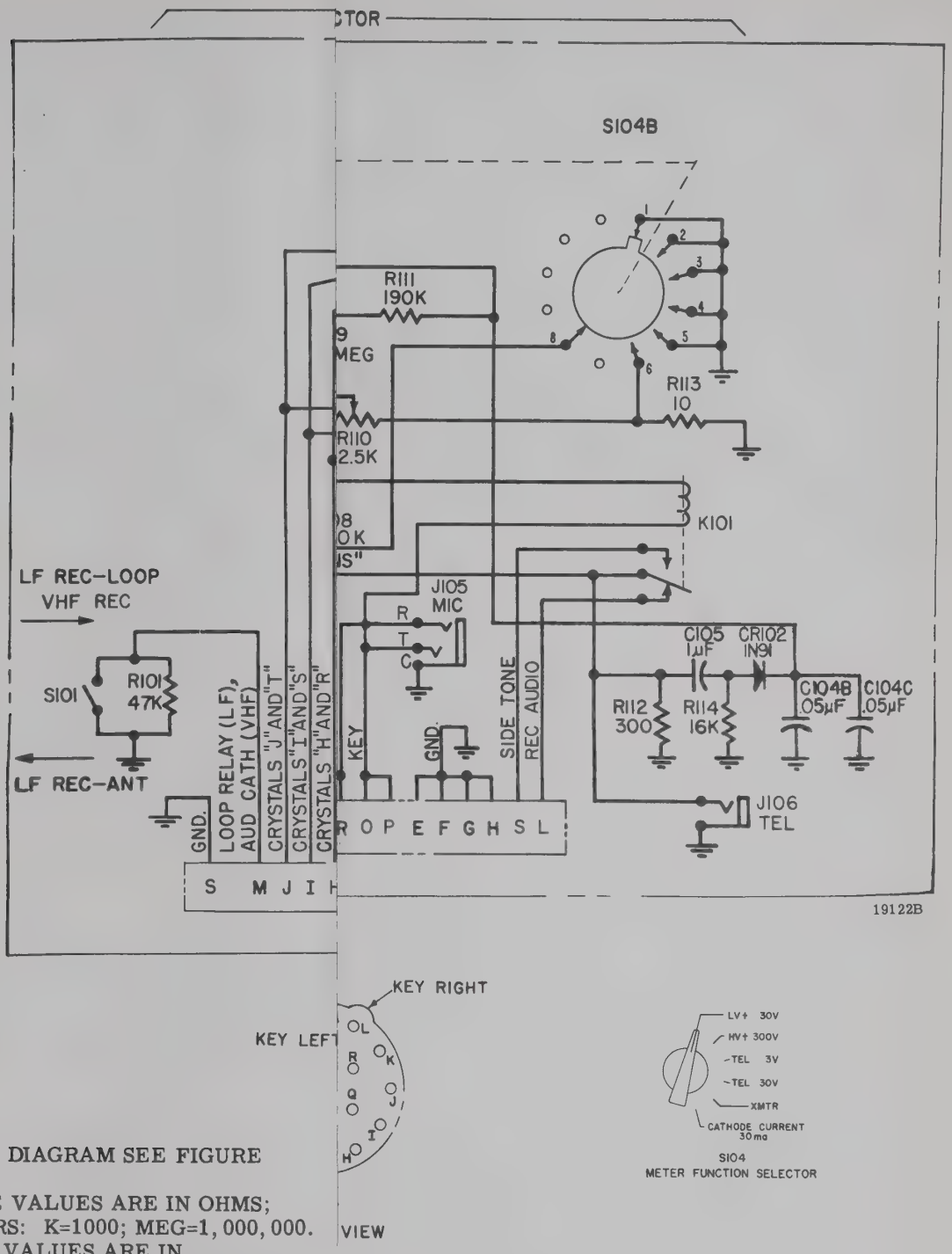
3–5. COAXIAL CABLE REPAIR.

Figure 3–7 supplies information for repairing or fabricating coaxial cables such as Cable Assembly ARC-11369.



TP1204

Figure 3–2. ARC Type H-19 Test Unit, Interior View

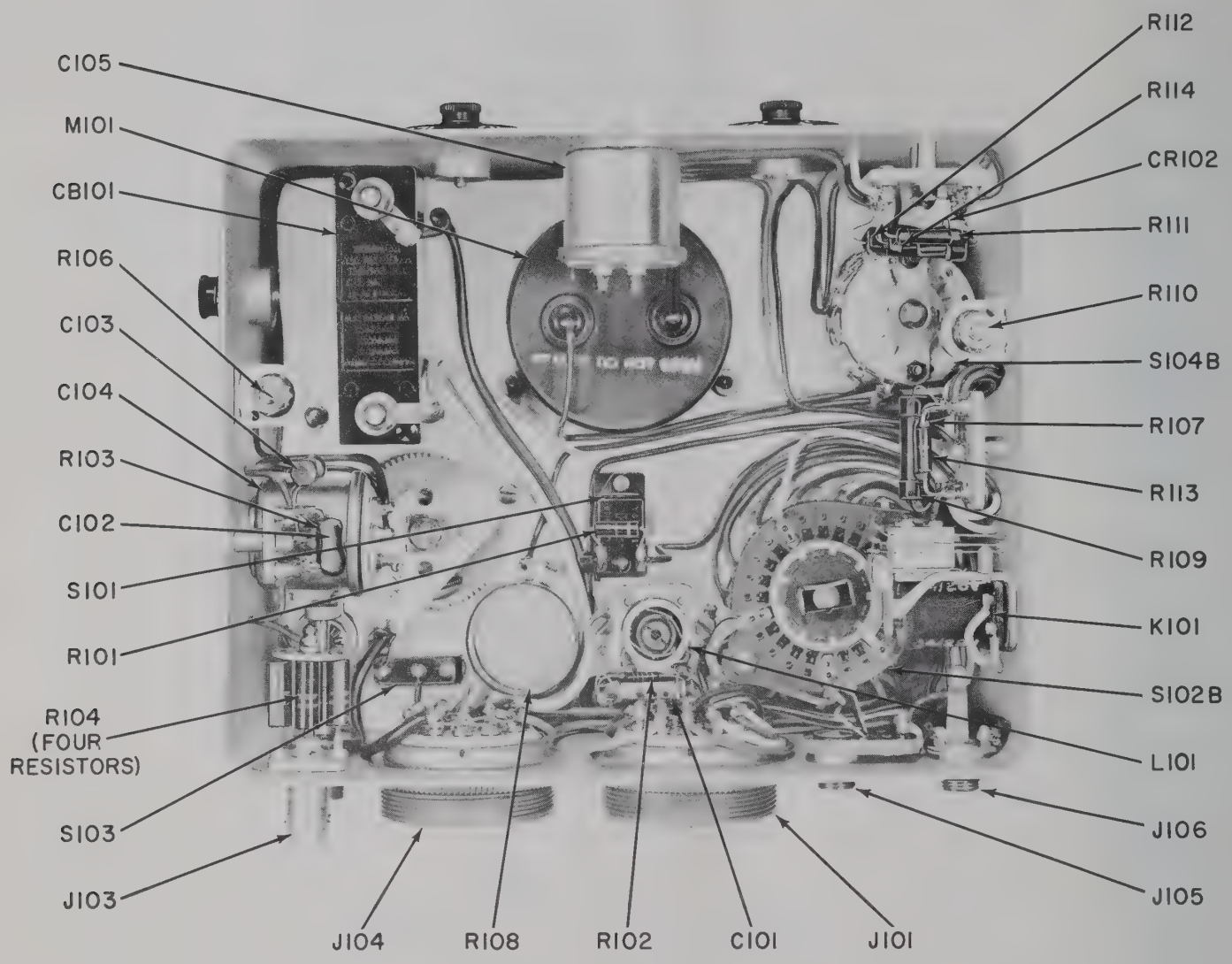


S104
METER FUNCTION SELECTOR

NOTES:

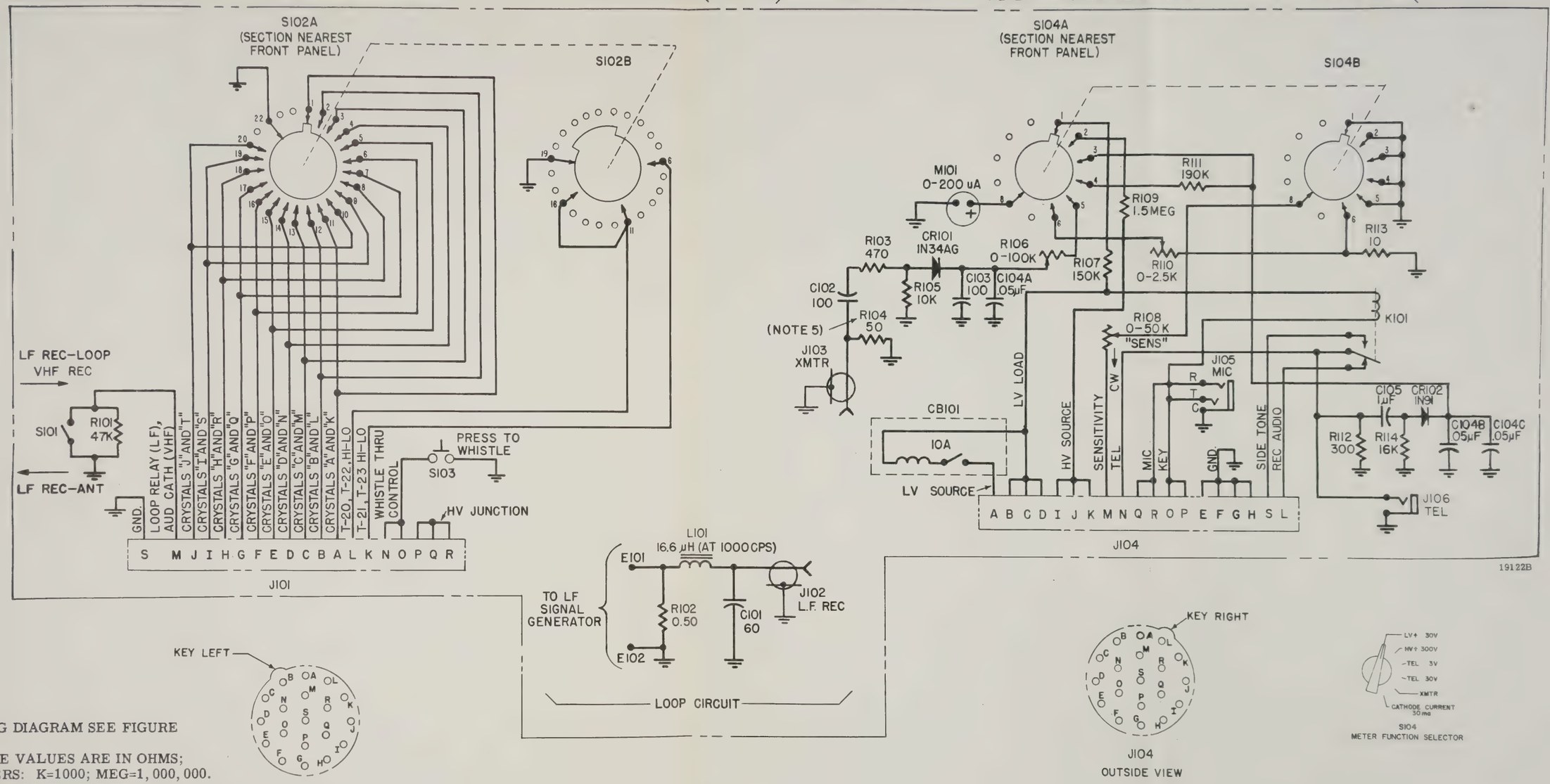
1. FOR WIRING DIAGRAM SEE FIGURE 3-4.
2. RESISTANCE VALUES ARE IN OHMS; MULTIPLIERS: K=1000; MEG=1,000,000.
3. CAPACITOR VALUES ARE IN MICROMICROFARADS ($\mu\mu$F) UNLESS OTHERWISE NOTED.
4. ROTARY SWITCH TERMINALS ARE VIEWED FROM KNOB END OF SWITCH IN ALL SECTIONS WITH SWITCHES IN POSITION.
5. R104 CONSISTS OF FOUR 200-OHM RESISTORS IN PARALLEL.

Figure 3–3. ARC Type H-19 Test Unit, Schematic Diagram



TP1204

Figure 3–2. ARC Type H-19 Test Unit, Interior View

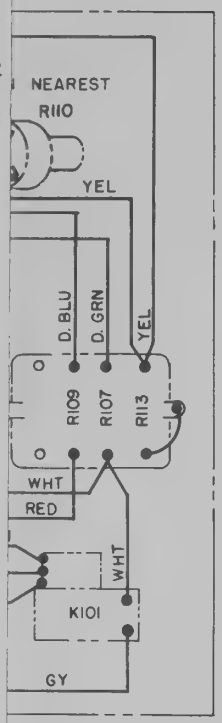


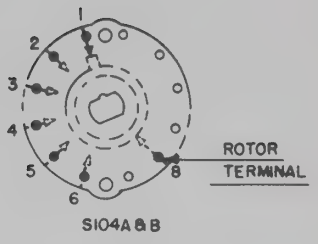
NOTES:

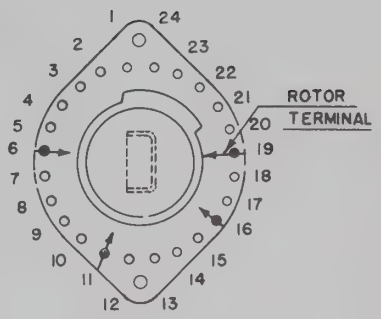
1. FOR WIRING DIAGRAM SEE FIGURE 3-4.
2. RESISTANCE VALUES ARE IN OHMS; MULTIPLIERS: K=1000; MEG=1,000,000.
3. CAPACITOR VALUES ARE IN MICROMICROFARADS ($\mu\mu$F) UNLESS OTHERWISE NOTED.
4. ROTARY SWITCH TERMINALS ARE VIEWED FROM KNOB END OF SWITCH IN ALL SECTIONS WITH SWITCHES IN POSITION.
5. R104 CONSISTS OF FOUR 200-OHM RESISTORS IN PARALLEL.

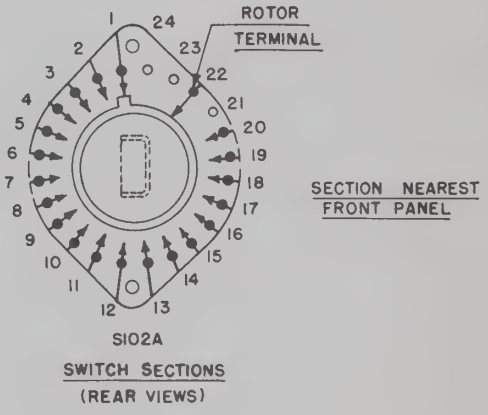
Figure 3–3. ARC Type H-19 Test Unit, Schematic Diagram

SYMBOL IDENTIFICATION TABLE		
Symbol No.	ARC Part No.	Description.
C101	8074	60 μμF
C102	8796	100 μμF
C103	8796	100 μμF
C104A, B, C	5414	3 x .05 μF
C105	16653	1 μF
CB101	18636	CIRCUIT BREAKER
CR101	15534	1N34AG (SEE NOTE
CR102	18723	1N91 (SEE NOTE 6)
J101	12357	RECEPTACLE
J102	11338	RECEPTACLE
J103 PART OF RESISTOR ASSEMBLY 16041		
J104	12350	RECEPTACLE
J105	9391	JACK ASSEMBLY
J106	7565	JACK ASSEMBLY
K101	19248	RELAY
L101	16046	COIL ASSEMBLY
M101	18588	MICROAMMETER
R101	201	47K
R102	16050	0.5
R103	201	470
R104	16041	50
R105	201	10K
R106	8825	0-100K
R107	205	150K
R108	6310	0-50K
R109	208	1.5MEG
R110	8737	0-2.5K
R111	205	190K
R112	208	300
R113	201	10
R114	205	16K
S101	8084	SPST TOGGLE SWIT
S102A & B	19257	SWITCH (2 SECTION
S103	17176	SPDT MICROSWITC
S104A & B	18567	SWITCH (2 SECTION









NOTES:

1. FOR SCHEMATIC DIAGRAM SEE
2. RESISTANCE VALUES ARE IN OI MEG=1,000,000.
3. WIRES MARKED WITH COLOR N COPPER, VINYLITE INSULATEI
4. WIRES MARKED WITH COLOR N ARE #18 STRANDED COPPER, V
5. UNMARKED WIRES ARE #22 BAI
6. SHADED ENDS OF CRYSTAL RE ENDS.

Figure 3–4. ARC Type H-19 Test Unit, Wiring Diagram

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C105	16653	1 μF
CB101	18636	CIRCUIT BREAKER
CR101	15534	1N34AG (SEE NOTE
CR102	18723	1N91 (SEE NOTE 6)
J101	12357	RECEPTACLE
J102	11338	RECEPTACLE
J103 PART OF RESISTOR ASSEMBLY 16041		
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L101	16046	COIL ASSEMBLY
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R104	16041	50
R105	201	10K
R106	8825	0-100K
R107	205	150K
R108	6310	0-50K
R109	208	1.5MEG
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R112	208	300
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S103	17176	SPDT MICROSWITCI
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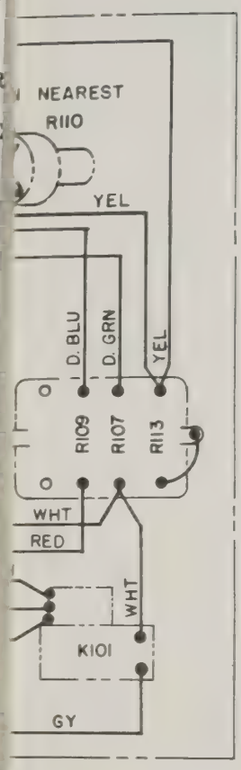

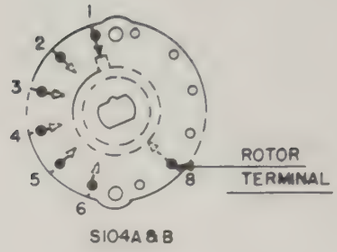

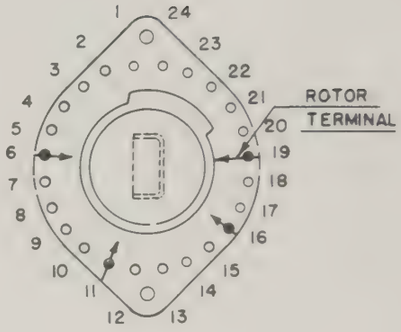

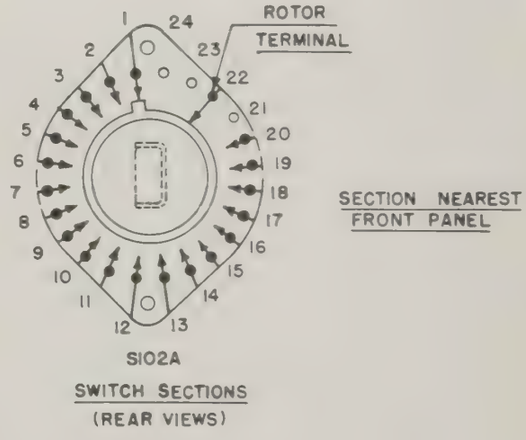

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R109	208	1.5MEG
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R112	208	300
R113	201	10
R114	205	16K
S101	8084	SPST TOGGLE SWITCH
S102A & B	19257	SWITCH (2 SECTION)
S103	17176	SPDT MICROSWITCH
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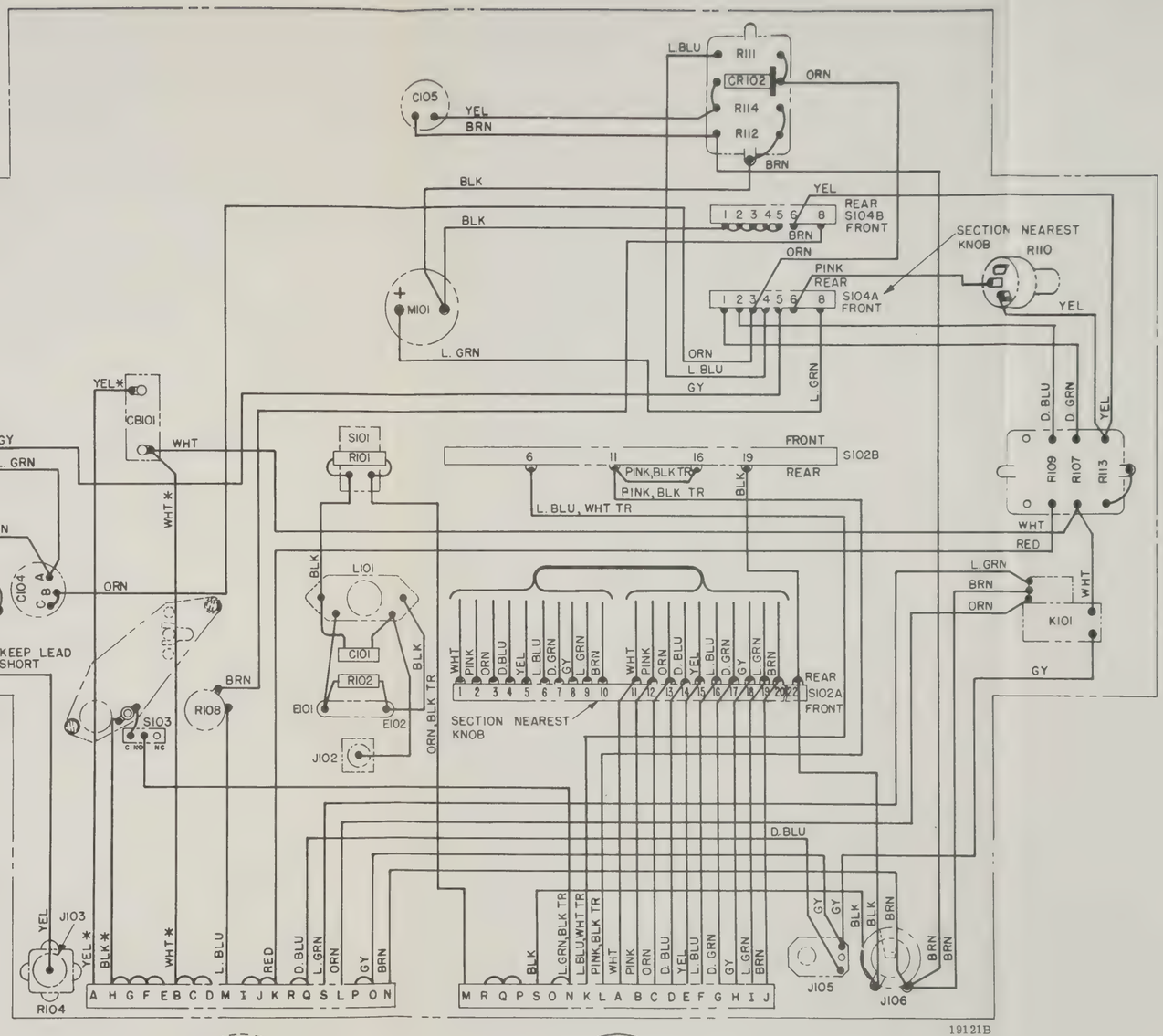
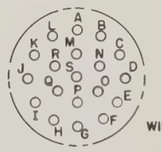
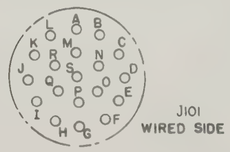
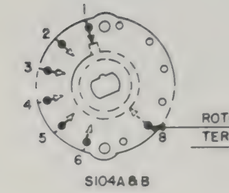
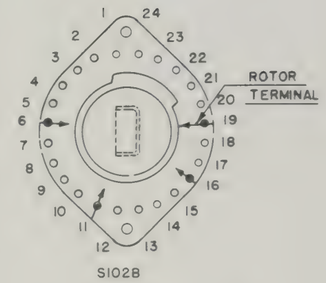
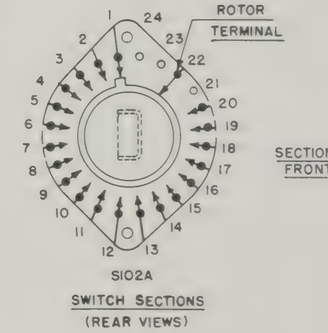












NOTES:

1. FOR SCHEMATIC DIAGRAM SEE FIGURE 3-3.
2. RESISTANCE VALUES ARE IN OHMS; MULTIPLIERS K=1000, MEG=1,000,000.
3. WIRES MARKED WITH COLOR NOTE ONLY ARE #22 SOLID COPPER, VINYLITE INSULATED.
4. WIRES MARKED WITH COLOR NOTE AND ASTERISK (*) ARE #18 STRANDED COPPER, VINYLITE INSULATED.
5. UNMARKED WIRES ARE #22 BARE, TINNED, SOLID COPPER.
6. SHADED ENDS OF CRYSTAL RECTIFIERS ARE CATHODE ENDS.

Figure 3–4. ARC Type H-19 Test Unit, Wiring Diagram

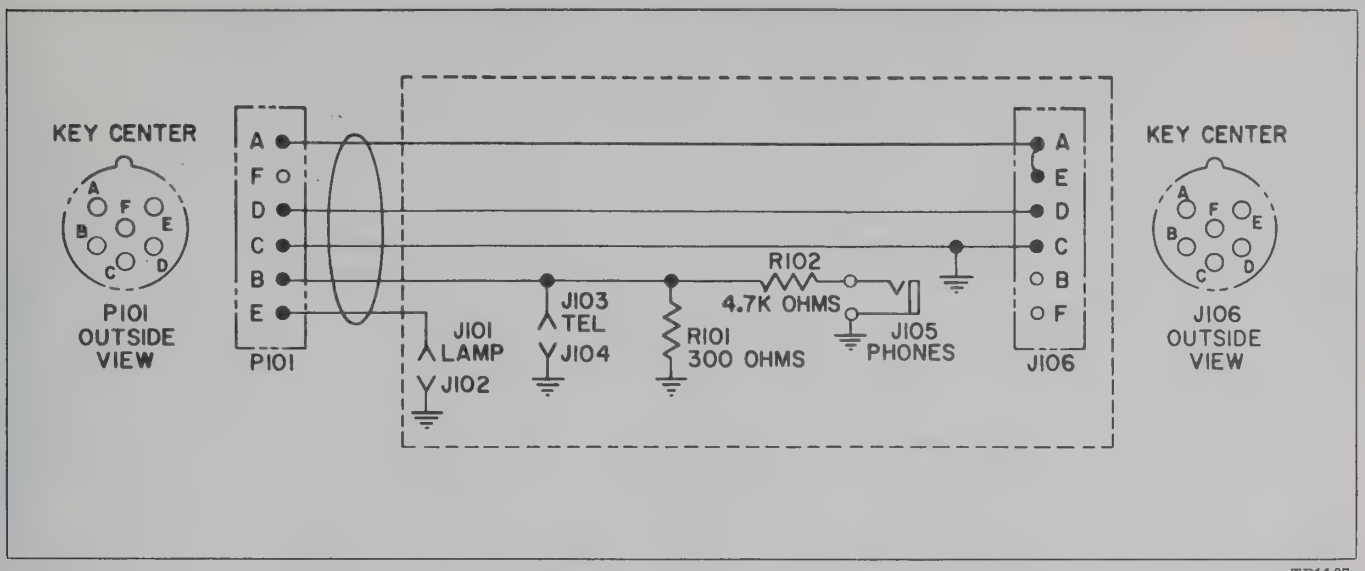
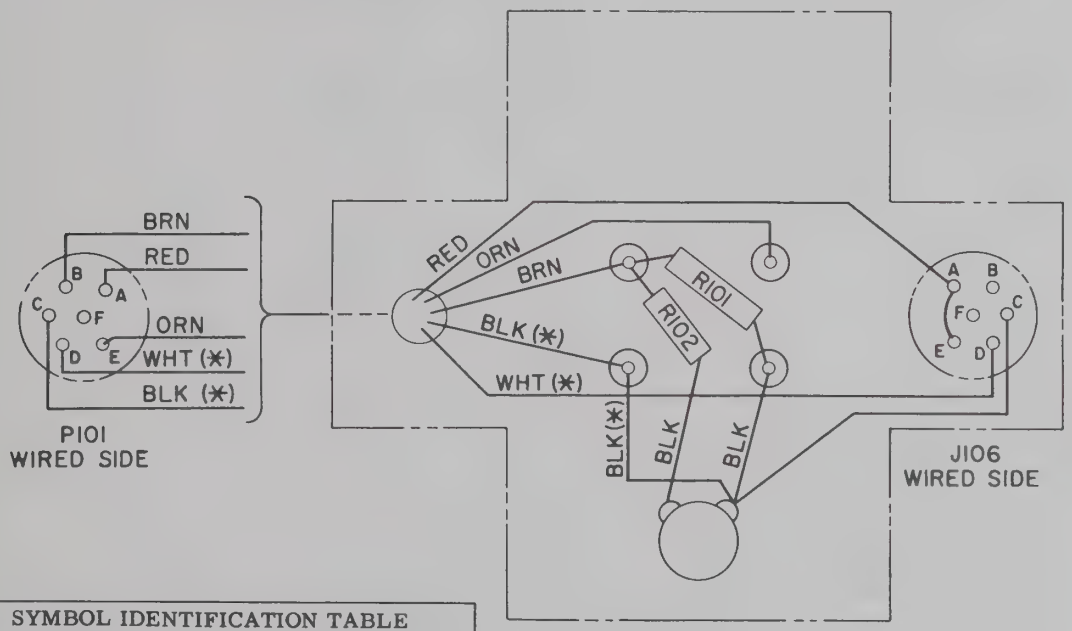


Figure 3–5. Cable Assembly ARC-20689, Schematic Diagram

TP1137



SYMBOL IDENTIFICATION TABLE		
Symbol No.	ARC Part No.	Description
J101	8803	TEST JACK (ORANGE)
J102	8803	TEST JACK (BLACK)
J103	8803	TEST JACK (BROWN)
J104	8803	TEST JACK (BLACK)
J105	7565	JACK
J106	11905	RECEPTACLE
P101	20764	PLUG ASSEMBLY
R101	202	300 OHMS
R102	201	4700 OHMS

NOTES:

1. FOR SCHEMATIC DIAGRAM SEE FIGURE 3-5.
2. WIRES MARKED WITH COLOR NOTE AND ASTERISK (*) ARE #22 STRANDED COPPER, VINYLITE INSULATED.
3. WIRES MARKED WITH COLOR NOTE ONLY ARE #24 STRANDED COPPER, VINYLITE INSULATED.
4. UNMARKED WIRE IS #22 SOLID, BARE, TINNED COPPER.

Figure 3–6. Cable Assembly ARC-20689, Wiring Diagram

TP1139

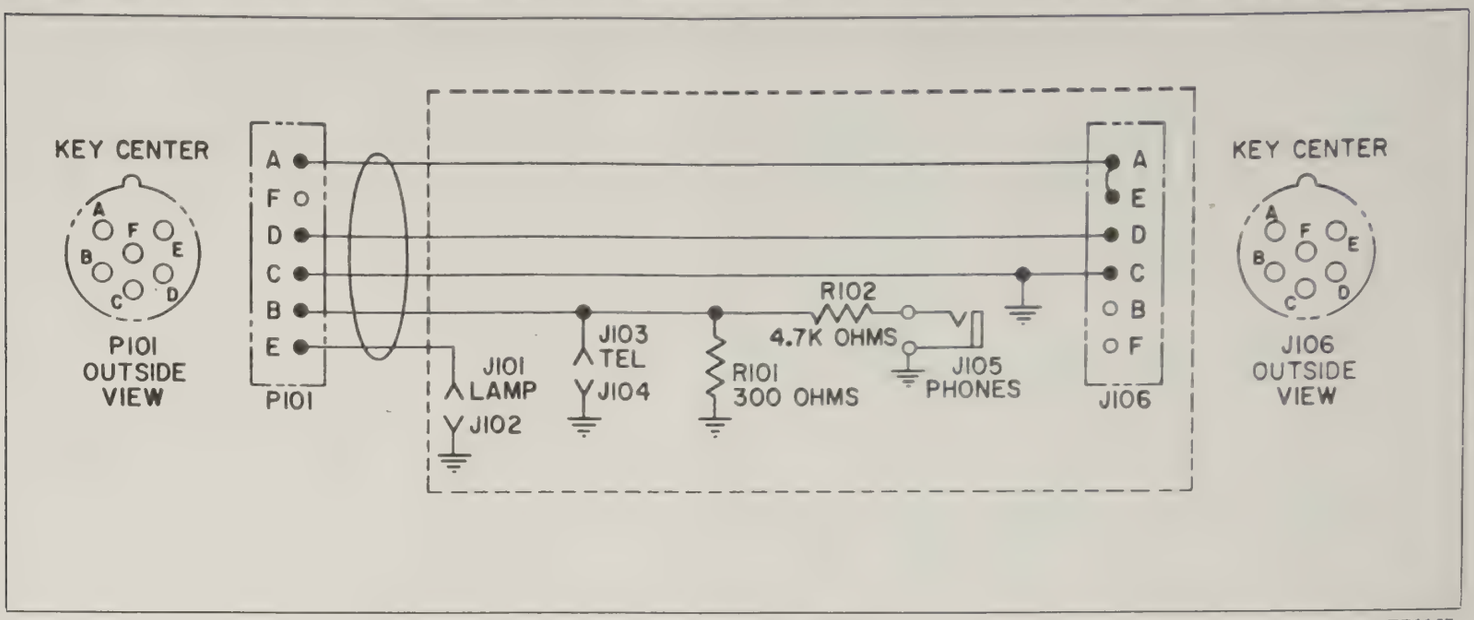
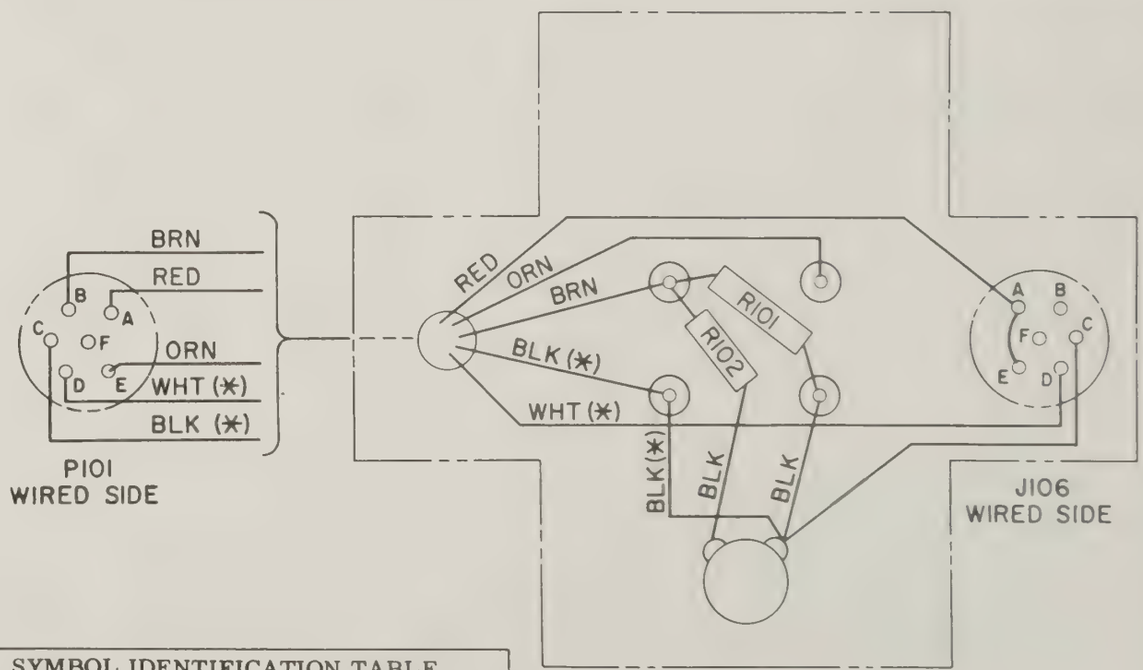


Figure 3–5. Cable Assembly ARC-20689, Schematic Diagram

TP1137



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NOTES:

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Figure 3–6. Cable Assembly ARC-20689, Wiring Diagram

TP1139

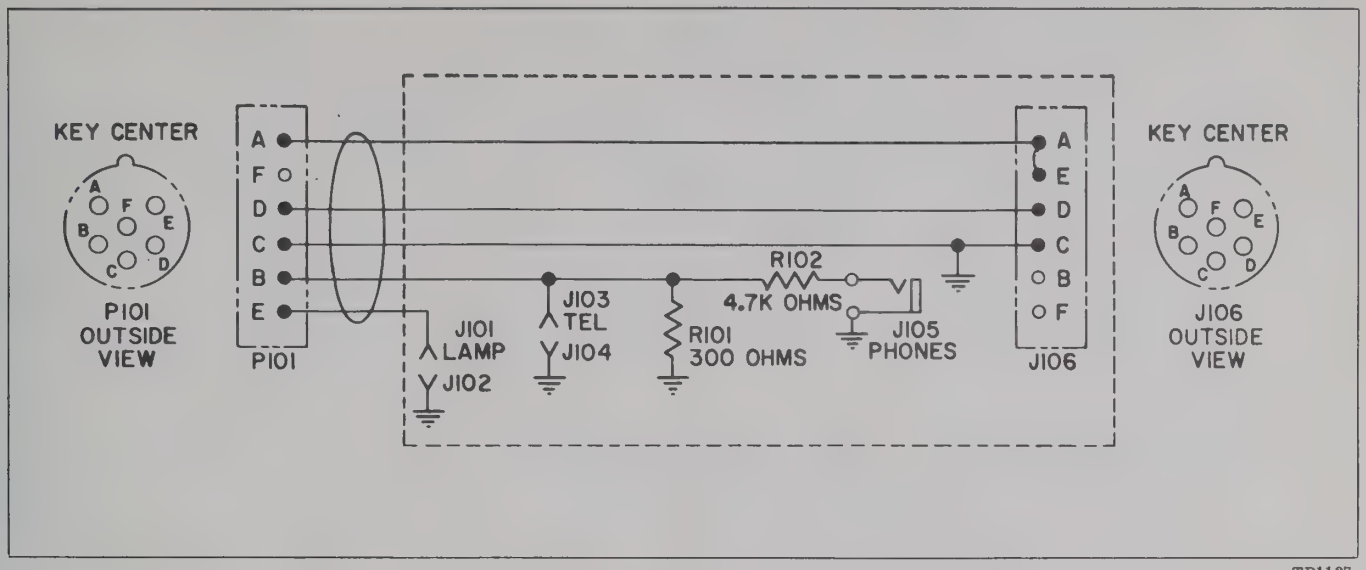
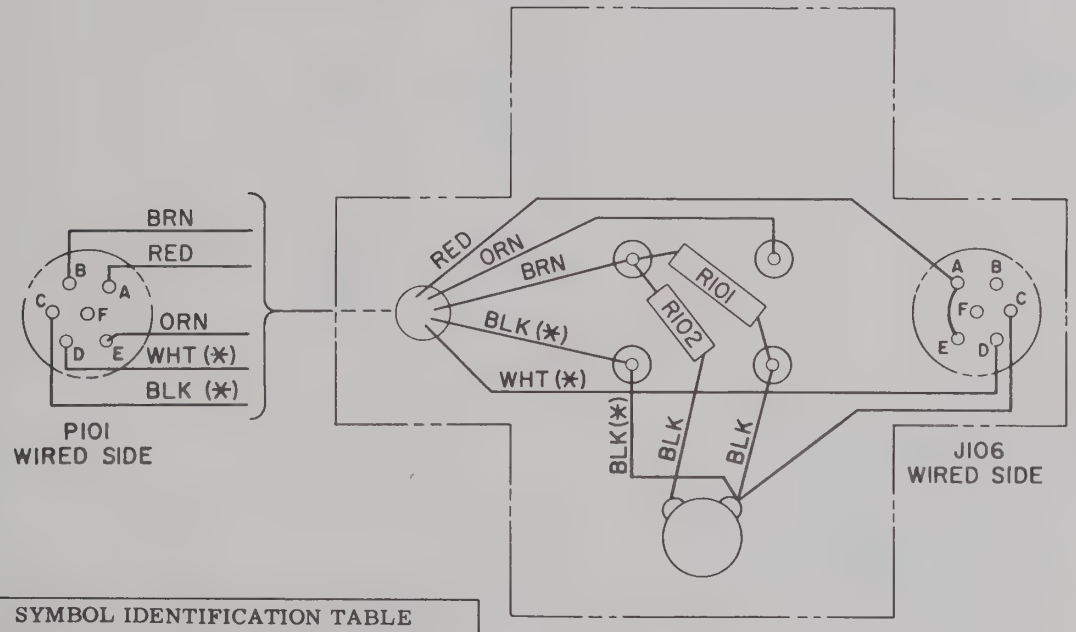


Figure 3–5. Cable Assembly ARC-20689, Schematic Diagram

TP1137



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NOTES:

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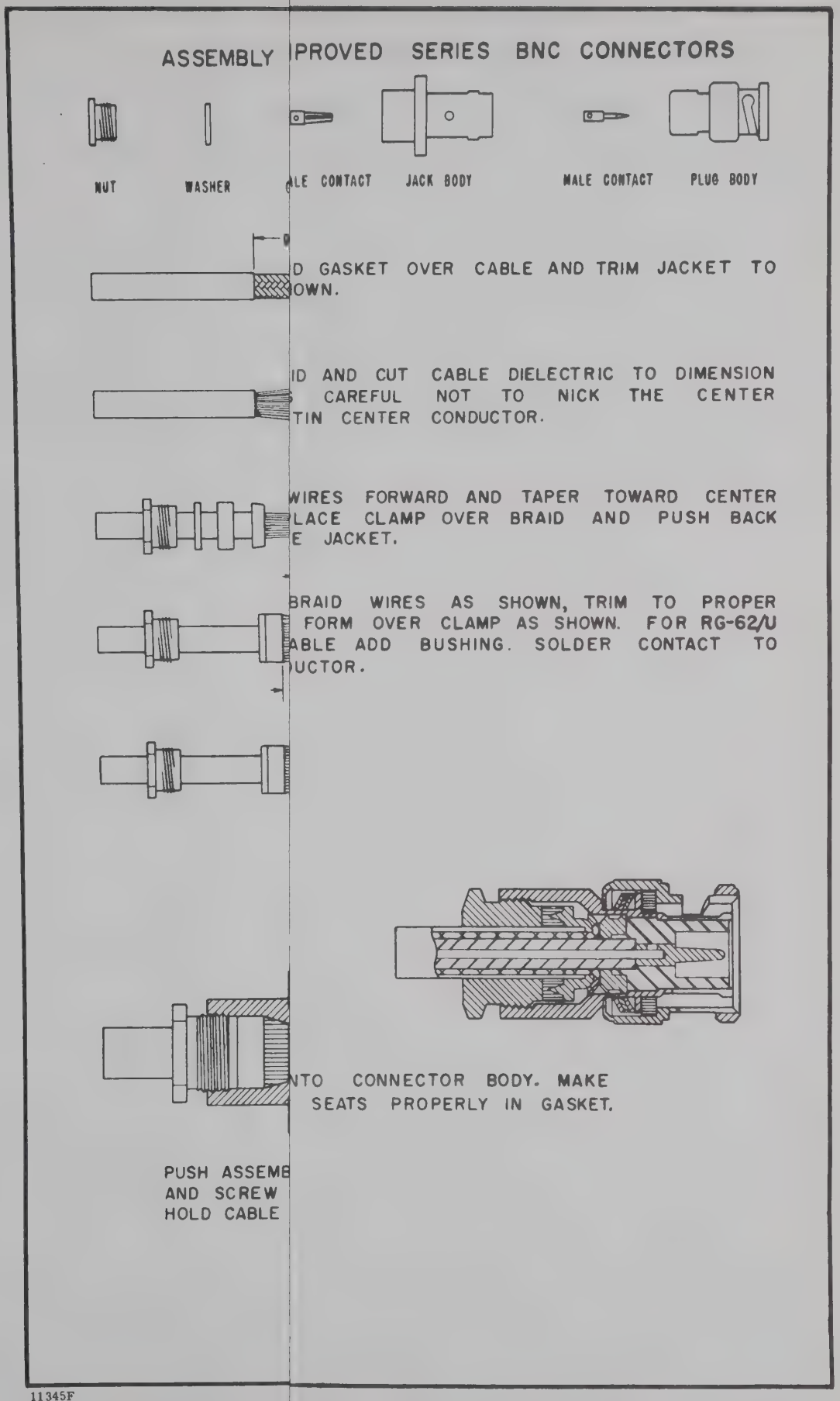
2. WIRES MARKED WITH COLOR NOTE AND ASTERISK (*) ARE #22 STRANDED COPPER, VINYLITE INSULATED.
3. WIRES MARKED WITH COLOR NOTE ONLY ARE #24 STRANDED COPPER, VINYLITE INSULATED.
4. UNMARKED WIRE IS #22 SOLID, BARE, TINNED COPPER.

Figure 3–6. Cable Assembly ARC-20689, Wiring Diagram

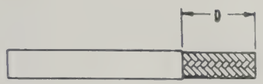
TP1139



11345F

Figure 3-7. Cable Assembly Instructions for BNC Connectors and RG-58/U Cable

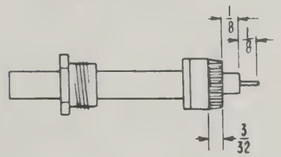
ASSEMBLY INSTRUCTIONS FOR SERIES BNC CONNECTORS



TRIM JACKET:
D = 1/4 FOR RG-58/U
D = 5/16 FOR RG-59/U
D = 7/16 FOR RG-71/U

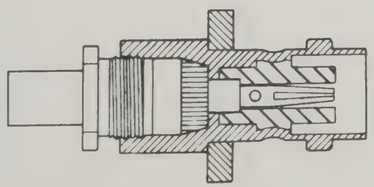
COMB OUT BRAID AND CUT CABLE DIELECTRIC TO DIMENSION SHOWN BEING CAREFUL NOT TO NICK THE CENTER CONDUCTOR. TIN CENTER CONDUCTOR.

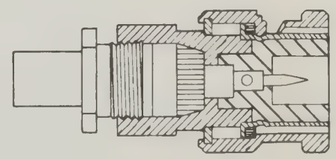
TAPER BRAID AND SLIDE NUT, WASHER, GASKET AND CLAMP OVER BRAID. CLAMP IS INSERTED SO THAT ITS INNER SHOULDER FITS SQUARELY AGAINST END OF CABLE JACKET.



WITH CLAMP IN PLACE, COMB OUT BRAID, FOLD BACK SMOOTH AS SHOWN AND TRIM 3/32" FROM END.

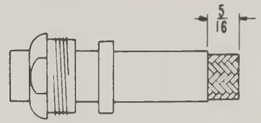
SLIP CONTACT IN PLACE, BUTT AGAINST DIELECTRIC AND SOLDER. REMOVE EXCESS SOLDER FROM OUTSIDE OF CONTACT. BE SURE CABLE DIELECTRIC IS NOT HEATED EXCESSIVELY AND SWOLLEN SO AS TO PREVENT DIELECTRIC FROM ENTERING INTO CONNECTOR BODY.



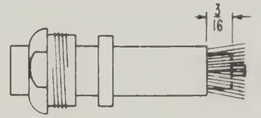


PUSH ASSEMBLY INTO BODY AS FAR AS IT WILL GO. SLIDE NUT INTO BODY AND SCREW IN PLACE WITH WRENCH UNTIL TIGHT. FOR THIS OPERATION, HOLD CABLE AND SHELL RIGID AND ROTATE NUT.

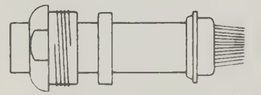
ASSEMBLY INSTRUCTIONS FOR IMPROVED SERIES BNC CONNECTORS



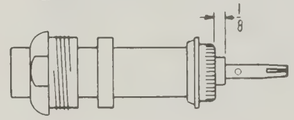
PLACE NUT AND GASKET OVER CABLE AND TRIM JACKET TO DIMENSION SHOWN.



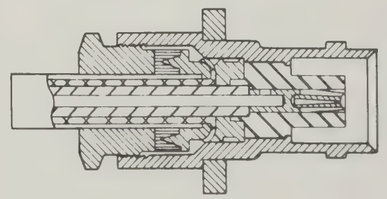
COMB OUT BRAID AND CUT CABLE DIELECTRIC TO DIMENSION SHOWN BEING CAREFUL NOT TO NICK THE CENTER CONDUCTOR. TIN CENTER CONDUCTOR.

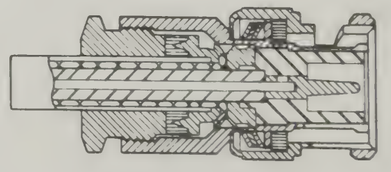


PULL BRAID WIRES FORWARD AND TAPER TOWARD CENTER CONDUCTOR. PLACE CLAMP OVER BRAID AND PUSH BACK AGAINST CABLE JACKET.



FOLD BACK BRAID WIRES AS SHOWN, TRIM TO PROPER LENGTH AND FORM OVER CLAMP AS SHOWN. FOR RG-62/U AND RG-71/U CABLE ADD BUSHING. SOLDER CONTACT TO CENTER CONDUCTOR.





INSERT CABLE AND PARTS INTO CONNECTOR BODY. MAKE SURE SHARP EDGE OF CLAMP SEATS PROPERLY IN GASKET. TIGHTEN NUT.

11345F

Figure 3-7. Cable Assembly Instructions for BNC Connectors and RG-58/U Cable

APPENDIX A
TEST PROCEDURES

A–1. INTRODUCTION.

This appendix contains alignment and test procedures for the ARC Type K-13 Oscillator-Relay Unit; the ARC Type T-11B, T-13A, T-20, T-21, T-22, T-23, and T-24A Transmitters; and the ARC Type R-10A, R-11A, R-15, R-19, R-20, and R-20A Receivers. The procedures are based on the use of the ARC Type BTK-19 Bench Test Kit and the test equipment listed in Table 1–2.

A–2. K-13 OSCILLATOR-RELAY UNIT TEST.

Step 1. Prepare the test system as described in paragraph 2–4 and interconnect the units using Cable Harness Assembly ARC-19270 as shown in Figure 2–2. Install an R-15 or R-19 Receiver and an ARC vhf transmitter with the K-13. Remove the bottom cover from the K-13.

Step 2. Set the H-19 test meter switch to TEL 30V.

Step 3. Turn the K-13 VHF WHISTLE LEVEL control to its extreme clockwise position.

Step 4. Turn the H-19 XMTR XTAL switch to the position corresponding to the center frequency of the vhf transmitter frequency band.

Step 5. Press the PRESS TO WHISTLE tuning crank and tune the receiver to the transmitter. When the receiver is accurately tuned to the transmitter frequency, a 1-kc tone is heard in the headset and the H-19 meter should read at least 7 volts.

Step 6. Set the K-13 UHF and VHF WHISTLE LEVEL controls approximately to their mid-range positions.

Step 7. Set the H-19 test meter switch to TEL 3V.

Step 8. Press the PRESS TO WHISTLE tuning crank and tune the receiver to the transmitter. Adjust the K-13 VHF WHISTLE LEVEL control to produce a 1-volt reading on the H-19 meter.

Step 9. Short-circuit terminal R of J4001 to ground on the K-13. Press the PRESS TO WHISTLE tuning crank and adjust the UHF WHISTLE LEVEL control to produce a 1-volt reading on the H-19 meter.

Step 10. Remove the short circuit from terminal R of J4001 and replace the bottom cover on the K-13.

A–3. T-11B AND T-21 TRANSMITTER ALIGNMENT AND TEST.

Step 1. Prepare the test system as described in paragraph 2–4 and interconnect the units using Cable Assembly ARC-19270, two Cable Assembly ARC-11369 (4 ft), and Cable Assembly ARC-11369(8 ft) as shown in Figure 2–2. Install an R-15 Receiver and a K-13 Oscillator-Relay Unit to permit "whistle-through" tests.

Step 2. Remove the snapslide cover from the top of the transmitter. Connect the Simpson Model 260 (2.5-volt dc scale) between the transmitter TEST jack and ground. (The TEST jack is located on the top of the chassis, in the right front corner.)

Step 3. Set the H-19 test meter switch to LV+ 30V. Adjust the primary power source to produce a 27.5-volt (or 13.75-volt) reading on the H-19 test meter.

Step 4. Insert a 116-mc crystal in No. 3 crystal socket in the T-11B or in No. 5 crystal socket in the T-21. Set the H-19 XMTR XTAL switch to position C and the test meter switch to XMTR.

Step 5. As a preliminary setting, set tuning slugs No. 1 and No. 2 nearly all the way down and tuning slug No. 3 nearly all the way up.

Step 6. Starting with tuning slug No. 1, key the microphone and adjust tuning slugs No. 1, 2, and 3, in sequence, to produce maximum power output as indicated on the H-19 test meter. The Simpson Model 260 reading facilitates initial tuning adjustments; as the meter reading increases, switch to the 10-volt dc scale. To avoid unnecessary power supply drain, key the microphone only during adjustment.

Note

A two-thirds-scale reading on the H-19 test meter indicates normal power output.

Step 7. Depress the PRESS TO WHISTLE tuning crank and tune the R-15 in the vicinity of 116 megacycles for maximum whistle.

Note

Make certain that maximum whistle occurs at the correct frequency. If it does not, the transmitter is resonated to an undesired multiplier product and must be retuned to the correct frequency. Check the positions of the tuning slugs.

Step 8. Disconnect the microphone from the H-19 and connect it to the MIC jack on the front panel of the transmitter. Check the operation of the MIC jack. Reconnect the microphone to the H-19.

Step 9. Insert the 116-mc crystal into each crystal socket, set the H-19 XMTR XTAL switch to the corresponding crystal position, and check that the power output is the same for each crystal position. Also, check that there is no power output when the crystal is removed.

Note

In the T-11B, crystal sockets 1, 2, 3, 4, and 5 correspond to XMTR XTAL positions A, B, C, D, and E, respectively. In the T-21, sockets 1, 3, 5, 7, and 9 correspond to positions A, B, C, D, and E, and sockets 2, 4, 6, 8, and 10 correspond to positions F, G, H, I, and J, respectively.

Step 10. Insert a 132-mc crystal in crystal socket No. 3 in the T-11B or in crystal socket No. 5 in the T-21. Set the H-19 XMTR XTAL switch to position C.

Step 11. As a preliminary setting, set tuning slugs No. 1 and 2 nearly all the way up and tuning slug No. 3 nearly all the way down. Repeat Steps 6 and 7 at 132 megacycles.

Step 12. Replace the 132-mc crystal with a 124-mc crystal.

Step 13. As a preliminary setting, set all tuning slugs approximately in their mid positions. Repeat Steps 6 and 7 at 124 megacycles.

Step 14. To check the modulation system, key the microphone and speak into it. If the modulation system is functioning properly, the H-19 test meter reading will increase during modulation and the sidetone output will be heard in the headset.

Step 15. Replace the snapslide cover.

A–4. T-13A AND T-23 TRANSMITTER ALIGNMENT AND TEST.

Step 1. Prepare the test system as described in paragraph 2–4 and interconnect the units using Cable Harness Assembly ARC-19270, two Cable Assembly ARC-11369(4 ft), and Cable Assembly ARC-11369(8 ft) as shown in Figure 2–2. Install an R-19 Receiver and a K-13 Oscillator-Relay Unit in the test system to permit "whistle-through" tests.

Step 2. Remove the snapslide cover from the top of the transmitter. Connect the Simpson Model 260 (2.5-volt dc scale) between the transmitter TEST jack and ground. (The TEST jack is located on the top of the chassis, in the right front corner.)

Step 3. Set the H-19 test meter switch to LV+ 30V. Adjust the primary power source to produce a 27.5-volt (or 13.75-volt) reading on the H-19 test meter.

Step 4. Insert a 132-mc crystal in No. 3 crystal socket in the T-13A or in No. 5 crystal socket in the T-23. Set the H-19 XMTR XTAL switch to position C and the test meter switch to XMTR.

Step 5. As a preliminary setting, set tuning slugs No. 1 and No. 2 nearly all the way down and tuning slug No. 3 nearly all the way up.

Step 6. Starting with tuning slug No. 1, key the microphone and adjust the tuning slugs in an ascending order to produce maximum power output as indicated on the H-19 test meter. The Simpson Model 260 reading facilitates initial tuning adjustments; as the meter reading increases, switch to the 10-volt dc scale. To avoid unnecessary power supply drain, key the microphone only during adjustment.

Note

A two-thirds-scale reading on the H-19 test meter indicates normal power output.

Step 7. Depress the PRESS TO WHISTLE tuning crank and tune the R-19 in the vicinity of 132 megacycles for maximum whistle.

Note

Make certain that maximum whistle occurs at the correct frequency. If it does not, the transmitter is resonated to an undesired multiplier product and must be retuned to the correct frequency. Check the positions of the tuning slugs.

Step 8. Disconnect the microphone from the H-19 and connect it to the MIC jack on the front panel of the transmitter. Check the operation of the MIC jack. Reconnect the microphone to the H-19.

Step 9. Insert the 132-mc crystal into each crystal socket, set the H-19 XMTR XTAL switch to the corresponding crystal position, and check that the power output is the same for each crystal position. Also, check that there is no power output when the crystal is removed.

Note

In the T-13A, crystal sockets 1, 2, 3, 4, and 5 correspond to XMTR XTAL positions A, B, C, D, and E, respectively. In the T-23, sockets 1, 3, 5, 7, and 9 correspond to positions A, B, C, D, and E, and sockets 2, 4, 6, 8, and 10 correspond to positions F, G, H, I, and J, respectively.

Step 10. Insert a 148-mc crystal in crystal socket No. 3 in the T-13A or in crystal socket No. 5 in the T-23. Set the H-19 XMTR XTAL switch to position C.

Step 11. As a preliminary setting, set tuning slugs No. 1 and No. 2 nearly all the way up and tuning slug No. 3 nearly all the way down. Repeat Steps 6 and 7 at 148 megacycles.

Step 12. Replace the 148-mc crystal with a 140-mc crystal.

Step 13. As a preliminary setting, set all tuning slugs approximately in their mid positions. Repeat Steps 6 and 7 at 140 megacycles.

Step 14. To check the modulation system, key the microphone and speak into it. If the modulation system is functioning properly, the H-19 test meter reading will increase during modulation and the sidetone output will be heard in the headset.

Step 15. Replace the 140-mc crystal with a 125-mc crystal. Install Capacity Plate ARC-15900.

Step 16. As a preliminary setting, set tuning slugs No. 1 and No. 2 nearly all the way down and tuning slug No. 3 nearly all the way up. Repeat Steps 6 and 7 at 125 megacycles.

Step 17. Replace the snapslide cover.

A–5. T-20 AND T-24A TRANSMITTER ALIGNMENT AND TEST.

Step 1. Prepare the test system as described in paragraph 2–4 and interconnect the units using Cable Harness Assembly ARC-19265, Cable Assembly ARC-11369(4 ft), and Cable Assembly ARC-11369(8 ft) as shown in Figure 2–4. Install an R-19 Receiver with a T-20, or an R-15 Receiver with a T-24A, in the test system to permit "whistle-through" tests. If the receiver is equipped with a squelch control, set it to the minimum squelch (extreme clockwise) position.

Step 2. Remove the top dust cover from the transmitter. Leave the bottom cover in place. Connect the Simpson Model 260 (2.5-volt dc scale) between the transmitter TEST jack on the front panel and ground.

Step 3. Set the H-19 test meter switch to LV+ 30V. Adjust the primary power supply to produce a 27.5-volt (or 13.75-volt) reading on the H-19 test meter.

Step 4. For the T-20, insert a 147-mc crystal in crystal position 11; for the T-24A, insert a 117-mc crystal.

Step 5. Set the H-19 XMTR XTAL switch to position K and the test meter switch to XMTR.

Step 6. Starting with HI-band tuning coil slug No. 1, key the microphone and adjust the HI-band tuning coil slugs in an ascending order to produce maximum power output as indicated on the H-19 test meter (clockwise rotation decreases frequency). The Simpson Model 260 reading facilitates tuning adjustments; as the meter reading increases, switch to the 10-volt dc scale. To avoid unnecessary power supply drain, key the microphone only during adjustment.

Note

A two-thirds-scale reading on the H-19 test meter indicates normal power output.

Step 7. Disconnect the microphone from the H-19 and connect it to the MIC jack on the front panel of the transmitter. Check the operation of the MIC jack. Reconnect the microphone to the H-19.

Step 8. Insert the 147-mc (or the 117-mc) crystal into each of the other HI-band crystal sockets (12 through 20), set the H-19 XMTR XTAL switch to the corresponding crystal position (L through T), and check that the power output is the same for each crystal position. Also, check that there is no power output when the crystal is removed.

Step 9. For the T-20, insert a 145-mc crystal in crystal position 1; for the T-24A, insert a 115-mc crystal.

Step 10. Set the H-19 XMTR XTAL switch to position A.

Step 11. Starting with LO-band tuning capacitor slug No. 1, key the microphone and adjust the LO-band tuning capacitor slugs in an ascending order to produce maximum power output as indicated on the H-19 test meter (clockwise rotation decreases frequency).

Step 12. Insert the 145-mc (or the 115-mc) crystal into each of the other LO-band crystal sockets (2 through 10), set the H-19 XMTR XTAL switch to the corresponding crystal position (B through J), and check that the power output is the same for each crystal position. Also, check that there is no power output when the crystal is removed.

Step 13. For the T-20, insert a 119-mc crystal in crystal position 2; for the T-24A, insert a 108-mc crystal; set the H-19 XMTR XTAL switch to position B, and repeat Step 11.

Step 14. For the T-20 only, insert a 131-mc crystal in crystal position 3, set the H-19 XMTR XTAL switch to position C, and repeat Step 11.

Step 15. Remove the 119-mc crystal (or 108-mc crystal) from crystal position 2 and insert it in crystal position 12. Set the H-19 XMTR XTAL switch to position L and repeat Step 6.

Step 16. For the T-20, insert a 123-mc crystal in crystal position 13; for the T-24A, insert a 112-mc crystal; set the H-19 XMTR XTAL switch to position M, and repeat Step 6.

Step 17. Remove the 119-mc crystal (or 108-mc crystal) from crystal position 12 and insert it in crystal position 2. Set the H-19 XMTR XTAL switch to position B and repeat Step 11. (The T-20 is now tuned to 123 megacycles on the HI band and 119 megacycles on the LO band; the T-24A is tuned to 112 megacycles on the HI band and 108 megacycles on the LO band.)

Step 18. To check the modulation system, key the microphone and speak into it. If the modulation system is functioning properly, the H-19 test meter reading will increase during modulation and the sidetone output will be heard in the headset.

Step 19. Tune the R-19 to approximately 119 megacycles, or the R-15 to approximately 108 megacycles. Depress the PRESS TO WHISTLE tuning crank and retune the receiver for maximum whistle.

Step 20. Set the H-19 test meter switch to TEL 30V.

Step 21. Loosen the VHF WHISTLE control locknut on the front panel of the transmitter. Rotate the VHF WHISTLE control to its extreme clockwise position.

Step 22. Depress the H-19 PRESS TO WHISTLE tuning crank; the H-19 test meter should read at least 7 volts.

Step 23. Rotate the transmitter's VHF WHISTLE control to its extreme counterclockwise position.

Step 24. Set the H-19 test meter switch to TEL 3V. Depress the PRESS TO WHISTLE tuning crank and adjust the transmitter's VHF WHISTLE control to produce a 1-volt reading on the H-19 test meter.

Step 25. Without disturbing the control setting, tighten the VHF WHISTLE control locknut.

Step 26. Short-circuit terminal R of J5202 to ground and repeat Steps 21 through 25 adjusting the VHF WHISTLE control.

Step 27. Remove the short circuit from terminal R of J5202. Replace the top dust cover.

A–6. T-22 TRANSMITTER TEST.

Step 1. Prepare the test system as described in paragraph 2–4 and interconnect the units using Cable Harness Assembly ARC-19265, Cable Harness Assembly ARC-11369(4 ft), and Cable Assembly ARC-11369 (8 ft) as shown in Figure 2–4. Install either an R-15 or an R-19 Receiver in the test system to permit "whistle-through" tests. If the receiver is equipped with a squelch control, set it to the minimum squelch (extreme clockwise) position.

Step 2. Remove the top dust cover from the T-22. Leave the bottom cover in place. Connect the Simpson Model 260 (2.5-volt dc scale) between the TEST jack on the front panel and ground.

Step 3. Set the H-19 test meter switch to LV+ 30V. Adjust the primary power supply to produce a 27.5-volt or 13.75-volt reading on the H-19 test meter.

Step 4. Insert a 126-mc crystal in crystal position 11 of the T-22.

Step 5. Set the H-19 XMTR XTAL switch to position K and the test meter switch to XMTR.

Step 6. Starting with HI-band tuning coil slug No. 1, key the microphone and adjust the HI-band tuning coil slugs in an ascending order to produce maximum power output as indicated on the H-19 test meter (clockwise rotation decreases frequency). The Simpson Model 260 reading facilitates initial tuning adjustments; as the meter reading increases, switch to the 10-volt dc scale. To avoid unnecessary power supply drain, key the microphone only during adjustment.

Note

A two-thirds-scale reading on the H-19 test meter indicates normal power output.

Step 7. Disconnect the microphone from the H-19 and connect it to the MIC jack on the front panel of the T-22. Check the operation of the MIC jack. Reconnect the microphone to the H-19.

Step. 8. Insert the 126-mc crystal into each of the other HI-band crystal sockets (11 through 20), set the H-19 XMTR XTAL switch to the corresponding crystal position (K through T), and check that the power output is the same for each crystal position. Also, check that there is no power output when the crystal is removed.

Step 9. Insert a 124-mc crystal in crystal position 1.

Step 10. Set the H-19 XMTR XTAL switch to position A.

Step 11. Starting with LO-band tuning capacitor slug No. 1, key the microphone and adjust the LO-band tuning capacitor slugs in an ascending order to produce maximum power output as indicated on the H-19 test meter (clockwise rotation decreases frequency).

Step 12. Insert the 124-mc crystal into each of the other LO-band crystal sockets (2 through 10), set the H-19 XMTR XTAL switch to the corresponding crystal position (B through J), and check that the power output is the same for each crystal position. Also, check that there is no power output when the crystal is removed.

Step 13. Insert a 119-mc crystal in crystal position 2, set the H-19 XMTR XTAL switch to position B, and repeat Step 11.

Step 14. Insert a 121-mc crystal in crystal position 12, set the XMTR XTAL switch to position L, and repeat Step 6.

Step 15. To check the modulation system, key the microphone and speak into it. If the modulation system is functioning properly, the H-19 test meter reading will increase during modulation and the sidetone output will be heard in the headset.

Step 16. Tune the receiver to approximately 121 megacycles. Depress the PRESS TO WHISTLE tuning crank and tune the receiver in the vicinity of 121 megacycles for maximum whistle.

Step 17. Set the H-19 test meter switch to TEL 30V.

Step 18. Loosen the VHF WHISTLE control locknut on the T-22 front panel. Rotate the VHF WHISTLE control to its extreme clockwise position.

Step 19. Depress the H-19 PRESS TO WHISTLE tuning crank; the H-19 test meter should read at least 7 volts.

Step 20. Rotate the T-22 VHF WHISTLE control to its extreme counterclockwise position.

Step 21. Set the H-19 test meter switch to TEL 3V. Depress the PRESS TO WHISTLE tuning crank, and adjust the T-22 VHF WHISTLE control to produce a 1-volt reading on the H-19 test meter.

Step 22. Without disturbing the control setting, tighten the VHF WHISTLE control locknut.

Step 23. Replace the top dust cover.

A–7. R-10A AND R-11A RECEIVER ALIGNMENT.

I-f Alignment.

Step 1. Prepare the test system as described in paragraph 2–4 and interconnect the units using Cable Harness Assembly ARC-19265 as shown in Figure 2–4.

Note

It is not necessary to install a transmitter in the test system; however, the dummy receptacle must be mated with the connector to which it is attached to complete the high-voltage circuit.

Step 2. Throw the H-19 toggle switch to LF REC-ANT and rotate the SENS control to its extreme clockwise position.

Step 3. Set the H-19 test meter switch to LV+ 30V. Adjust the primary power source to produce a 27.5-volt (or 13.75-volt) reading on the H-19 meter. Warm up the receiver with the D-10A Dynamotor operating for at least 15 minutes at rated low-voltage input.

Step 4. Set the Ferris Model 16C Signal Generator to *exactly 239 kc* for the R-10A or *exactly 85 kc* for the R-11A, 30 per cent modulated at 1000 cps by the Hewlett-Packard Model 200AB Audio Oscillator.

Step 5. Remove the snapslide cover from the top of the receiver.

Step 6. Using Test Probe ARC-16139, connect the output of the signal generator in series with a .006-μf capacitance to the mixer-grid test jack.

Step 7. Set the H-19 test meter switch to TEL 3V.

Step 8. Remove the knurled cap from each i-f coupling unit in the receiver.

Note

There are two holes under each knurled cap marked "1" and "2." The trimmer under "1" tunes the primary and the trimmer under "2" tunes the secondary of the i-f coupling unit.

Step 9. Set the variable coupling rods on all three i-f coupling units to their "up" positions.

Step 10. Starting with the third i-f coupling unit, adjust the six trimmer capacitors to produce maximum deflection of the H-19 meter. Keep the H-19 meter reading below 2 volts during these adjustments by decreasing the signal generator output.

Step 11. Set the H-19 test meter switch to CATHODE CURRENT 30 ma.

Step 12. Increase the signal generator output until the cathode current is reduced to approximately 5 ma. Set the H-19 test meter switch to TEL 3V.

Step 13. Adjust trimmer "2" of the third i-f coupling unit to produce maximum deflection of the H-19 meter. Set the variable coupling rods to their "down" positions, then replace the knurled caps.

R-f Alignment.

Step 1. With the test system prepared as it was for i-f alignment, connect the output of the signal generator to the "A" post on receivers with one antenna post, or to the "L" post on receivers with two antenna posts.

Step 2. For the R-10A, set the signal generator to *exactly 1400 kc,* 30 per cent modulated at 1000 cps. For the R-11A, set the signal generator to *exactly 520 kc,* 30 per cent modulated at 400 cps.

Step 3. Set the H-19 test meter switch to TEL 3V.

Step 4. Rotate Knob ARC-18802 3.0 revolutions clockwise from its minimum-capacitance setting for the R-10A or 2.5 revolutions clockwise for the R-11A.

Step 5. Set oscillator series trimmer capacitor C516 in the R-10A or C616 in the R-11A to approximately mid capacitance.

Step 6. Adjust oscillator shunt trimmer capacitor C504F in the R-10A or C604F in the R-11A, r-f amplifier trimmer capacitor C504C in the R-10A or C604C in the R-11A, and the ALIGN INPUT control to produce maximum deflection of the H-19 meter. Keep the H-19 meter reading below 1 volt during these adjustments by decreasing the signal generator output.

Step 7. For the R-10A, set the signal generator to *exactly 570 kc,* 30 per cent modulated at 1000 cps. For the R-11A, set the signal generator to *exactly 210 kc,* 30 per cent modulated at 400 cps. Tune the receiver in the vicinity of 570 kc (approximately 26.5 revolutions of the knob) or 210 kc (approximately 26.4 revolutions of the knob) to produce maximum deflection of the H-19 meter.

Step 8. Determine which of the two extreme capacitance settings of C516 in the R-10A or C616 in the R-11A produces the greater output when the receiver is tuned to produce maximum deflection of the H-19 meter in each case. Note the H-19 meter reading and the position of the knob.

Step 9. Find a second position of C516 in the R-10A or C616 in the R-11A which produces the same H-19 meter reading when the receiver is tuned to produce maximum deflection of the H-19 meter. Note the position of the knob.

Step 10. Set the knob midway between the positions noted in Steps 8 and 9. Adjust C516 (or C616) to produce maximum deflection of the H-19 meter. Note the position of the knob.

Step 11. For the R-10A, set the signal generator to *exactly 1400 kc,* 30 per cent modulated at 1000 cps. For the R-11A, set the signal generator to *exactly 520 kc,* 30 per cent modulated at 1000 cps. Rotate the knob 3.0 revolutions clockwise from its minimum-capacitance setting for the R-10A or 2.5 revolutions clockwise for the R-11A.

Step 12. Adjust C504F in the R-10A or C604F in the R-11A to produce maximum deflection of the H-19 meter. Use minimum signal generator output for this adjustment.

Step 13. Replace the snapslide cover.

A–8. R-10A AND R-11A RECEIVER TESTS.

Note

Before the following tests are made, the receiver must be properly aligned (refer to paragraph A-7); also, it must warm up for at least 15 minutes at rated low-voltage input with the D-10A Dynamotor operating. Prepare the test system as described in paragraph 2–4 and interconnect the units using Cable Harness Assembly ARC-19265 as shown in Figure 2–4.

High-dial Sensitivity.

Step 1. Set the H-19 test meter switch to TEL 3V and the SENS control to its extreme clockwise position. Remove the dust cover from the top of the receiver.

Step 2. Connect the output of the Ferris Model 16C Signal Generator to the "A" post on receivers with one antenna post, or to the "L" post on receivers with two antenna posts.

Step 3. Rotate Knob ARC-18802 3.0 revolutions clockwise from its minimum-capacitance setting for the R-10A or 2.5 revolutions clockwise for the R-11A.

Step 4. Tune the signal generator, 30 per cent modulated at 1000 cps by the Hewlett-Packard Model 200AB Audio Oscillator, to resonance with the receiver.

Step 5. Adjust the ALIGN INPUT control to produce maximum deflection of the H-19 meter. Keep the H-19 meter reading below 1 volt during this adjustment by decreasing the signal generator output.

Step 6. Adjust the signal generator output to produce a 1.73-volt reading on the H-19 meter (10 milliwatts into 300 ohms). For the R-10A, the signal generator output should be 0.9 microvolt or less; for the R-11A it should be 0.6 microvolt or less.

R-f Sensitivity at Mixer Grid.

Step 1. Connect the output of the signal generator in series with a .006-μf capacitance to the mixer-grid test jack. Tune the signal generator to resonance with the R-10A (1400 kc) or the R-11A (520 kc).

Step 2. Adjust the signal generator output to produce a 1.73 volt reading on the H-19 meter. For the R-10A, the signal generator output should be between 55 and 130 microvolts; for the R-11A it should be between 30 and 90 microvolts.

Electrical and Mechanical Stability.

Step 1. Connect the output of the signal generator to the "A" post on receivers with one antenna post, or to the "L" post on receivers with two antenna posts.

Step 2. Tune the signal generator to 1400 kc for the R-10A or 520 kc for the R-11A, turn modulation off, and set the output to 0.5 volt.

Step 3. Rotate the knob and simultaneously explore the H-19 SENS control range while listening for motorboating, constant-pitch tones, or other unnatural noises, excluding "tweets."

Step 4. Tap the chassis and tubes in the receiver while listening for microphonics and noise.

AVC Knee Output.

Step 1. Rotate the knob 3.0 revolutions clockwise from its minimum-capacitance setting for the R-10A or 2.5 revolutions clockwise for the R-11A.

Step 2. Tune the signal generator, 30 per cent modulated at 1000 cps, to resonance with the receiver. Keep the H-19 meter reading below 1 volt during this adjustment.

Step 3. Set the H-19 test meter switch to CATHODE CURRENT 30 ma. Increase the signal generator output until the cathode current is reduced 1 ma.

Step 4. Set the H-19 test meter switch to TEL 30V. The H-19 meter should read between 7.2 and 11 volts for the R-10A or between 7.5 and 13 volts for the R-11A.

AVC. With the signal generator tuned to resonance with the receiver, increase the signal generator output to 0.1 volt. The H-19 meter should read less than 19 volts for the R-10A or less than 18 volts for the R-11A.

Overload. Increase the signal generator output to 0.5 volt. The H-19 meter should read less than 25 volts for the R-10A or less than 24 volts for the R-11A.

High-dial Selectivity, 10:1 Down.

Step 1. With the signal generator tuned to resonance with the receiver, set the signal generator output to 50 microvolts.

Step 2. Set the H-19 test meter switch to TEL 3V. Set the SENS control to produce a 1-volt reading on the H-19 meter.

Step 3. Increase the signal generator output to 500 microvolts. Raise the signal generator frequency until the H-19 meter reads 1 volt. Note the signal generator frequency.

Step 4. Lower the signal generator frequency until the H-19 meter reads 1 volt and note the signal generator frequency. The selectivity for 10:1 down is the difference between the signal generator frequencies and should be less than 11.5 kc for the R-10A or less than 7.3 kc for the R-11A.

Loop Sensitivity.

Step 1. Tune the signal generator to resonance with the receiver. Set the signal generator output to 3 microvolts.

Step 2. Set the H-19 SENS control to produce a 1.73-volt reading on the H-19 meter.

Step 3. Connect the signal generator output to the LOOP CKT INPUT binding posts on the H-19.

Step 4. Interconnect the H-19 LF REC and the receiver loop connectors with Cable Assembly ARC-11369(4 ft). Throw the H-19 toggle switch to LF REC-LOOP.

Step 5. Increase the signal generator output until the H-19 meter reads 0.72 volts for the R-10A or 1.73 volts for the R-11A. The loop sensitivity is 1/10 of the signal generator output and should be less than 1.8 microvolts for the R-10A or less than 1 microvolt for the R-11A.

Audio Fidelity.

Step 1. Connect the output of the signal generator to the "A" post on receivers with one antenna post, or to the "L" post on receivers with two antenna posts.

Step 2. Set the H-19 toggle switch to LF REC-ANT.

Step 3. Tune the signal generator to resonance with the receiver. Set the signal generator output to 3 microvolts.

Step 4. Set the H-19 SENS control to produce a 2-volt reading on the H-19 meter.

Step 5. Change the signal generator modulation frequency to 200 cps. The H-19 meter reading should be between 0.56 and 1 volt for the R-10A or between 0.44 and 0.86 volt for the R-11A.

Step 6. Change the signal generator modulation frequency to 2000 cps. The H-19 meter reading should be between 1.3 and 1.8 volts for the R-10A or between 0.46 and 0.8 volt for the R-11A.

Mid-dial Calibration.

Step 1. Tune the signal generator, 30 per cent modulated at 1000 cps, to resonance with the receiver. Set the signal generator output to 3 microvolts.

Step 2. Set the H-19 SENS control to produce a 1.73-volt reading on the H-19 meter.

Step 3. Rotate the knob 15.725 revolutions clockwise from its minimum-capacitance setting for the R-10A or 15.72 revolutions clockwise for the R-11A.

Step 4. Tune the signal generator to resonance with the receiver. Keep the H-19 meter reading below 2 volts by appropriate setting of the signal generator output.

Step 5. Note the signal generator frequency. For the R-10A, the difference between the signal generator frequency and 900 kc is the calibration error and should be less than 3.2 kc. For the R-11A, the difference between the signal generator frequency and 330 kc should be less than 1.2 kc.

Mid-dial Sensitivity. Without disturbing the setting of the H-19 SENS control, adjust the signal generator output to produce a 1.73-volt reading on the H-19 meter. The signal generator output should be between 1.8 and 3.6 microvolts for the R-10A or between 2.1 and 6 microvolts for the R-11A.

Noise.

Step 1. Set the H-19 SENS control to its extreme clockwise position. Set the signal generator output to minimum and detune it at least 10 kc from 570 kc for the R-10A or 210 kc for the R-11A.

Step 2. For the R-10A, rotate the knob 26.47 revolutions clockwise from its minimum-capacitance setting; the H-19 meter should read less than 3 volts. For

the R-11A, rotate the knob 26.38 revolutions clockwise from its minimum-capacitance setting; the H-19 meter should read less than 4.7 volts.

Step 3. Tune the signal generator to resonance with the receiver. Set the signal generator output to 3 microvolts.

Step 4. Set the H-19 SENS control to produce a 1.73-volt reading on the H-19 meter.

Step 5. Remove the signal generator modulation. The H-19 meter should read less than 1.2 volts for the R-10A or less than 1.6 volts for the R-11A.

Step 6. Turn the signal generator modulation on. Set the H-19 SENS control to its extreme counterclockwise position. The H-19 meter should read zero.

Low-dial Calibration.

Step 1. Rotate the tuning knob 3.0 revolutions clockwise from its minimum-capacitance setting for the R-10A or 2.5 revolutions clockwise for the R-11A. Tune the signal generator to resonance with the receiver.

Step 2. Set the signal generator output to 3 microvolts.

Step 3. Set the H-19 SENS control to produce a 1.73-volt reading on the H-19 meter.

Step 4. Rotate the knob 26.47 revolutions clockwise from its minimum-capacitance setting for the R-10A or 26.38 revolutions clockwise for the R-11A.

Step 5. Tune the signal generator to resonance with the receiver. Keep the H-19 meter reading below 2 volts by appropriate setting of the signal generator output.

Step 6. Note the signal generator frequency. For the R-10A, the difference between the signal generator frequency and 570 kc is the calibration error and should be less than 2 kc; for the R-11A, the difference between the signal generator frequency and 210 kc should be less than 0.74 kc.

Low-dial Sensitivity. With the signal generator tuned to resonance with the receiver, adjust the signal generator output to produce a 1.73-volt reading on the H-19 meter. Do not disturb the setting of the H-19 SENS control. For the R-10A, the signal generator output should be between 1.8 and 3.6 microvolts; for the R-11A, the output should be between 2.1 and 6 microvolts.

Low-dial Bandwidth, 2:1 Down.

Step 1. Set the signal generator output to 50 microvolts.

Step 2. Set the H-19 SENS control to produce a 1-volt reading on the H-19 meter when the signal generator is tuned to resonance with the receiver.

Step 3. Increase the signal generator output to 100 microvolts. Raise the signal generator frequency until the H-19 meter reads 1 volt. Note the signal generator frequency.

Step 4. Lower the signal generator frequency until the H-19 meter reads 1 volt. The bandwidth for 2:1 down is the difference between the signal generator frequencies and for the R-10A should be greater than 4.4 kc; for the R-11A the difference should be greater than 3.1 kc.

Step 5. Replace the dust cover.

A–9. R-15 AND R-19 RECEIVER ALIGNMENT.

I-f Alignment.

Step 1. Prepare the test system as described in paragraph 2–4 and interconnect the units using Cable Harness Assembly ARC-19265 as shown in Figure 2–4.

Note

It is not necessary to install a transmitter in the test system; however, the dummy receptacle must be mated with the connector to which it is attached to complete the high-voltage circuit.

Step 2. Throw the H-19 toggle switch to VHF REC and rotate the SENS control to its extreme clockwise position.

Step 3. Set the H-19 test meter switch to LV+ 30V. Adjust the primary power source to produce a 27.5-volt (or 13.75-volt) reading on the H-19 meter. Warm up the receiver with the D-10A Dynamotor operating for at least 15 minutes at rated low-voltage input.

Step 4. If the receiver is equipped with a squelch control, rotate the squelch control to its extreme clockwise position (minimum squelch).

Step 5. Rotate Knob ARC-18802 5.2 revolutions clockwise from its minimum-capacitance setting for the R-15 or 4.75 revolutions clockwise for the R-19.

Step 6. Short-circuit the receiver antenna input connector to ground.

Step 7. Connect the Boonton Radio Corporation Type 505-B 6-db Attenuator to the RF OUTPUT connector on the Hewlett-Packard Model 608D Signal Generator.

Step 8. Tune the signal generator to exactly 15 mc, 30 per cent modulated at 1000 cps by the Hewlett-Packard Model 200AB Audio Oscillator. (Use the internal crystal calibrator for accurate frequency determination.)

Step 9. Remove the snapslide cover from the top of the receiver.

Step 10. Using Test Probe ARC-16139, connect the output of the signal generator through the 6-db attenuator to the mixer-grid test jack.

Step 11. Set the H-19 test meter switch to TEL 3V.

Step 12. Remove the knurled cap from each i-f coupling unit.

Note

There are two holes under each knurled cap marked "1" and "2." The trimmer under "1" tunes the primary and the trimmer under "2" tunes the secondary of the i-f coupling unit.

Step 13. Starting with the fourth i-f coupling unit, tune the eight trimmer capacitors to produce maximum deflection of the H-19 meter. During this procedure, reduce the signal generator output as required to keep the H-19 meter reading below 2 volts.

Step 14. Detune trimmer "1" of the fourth i-f coupling unit in the direction which produces maximum detuning. Retune trimmer "2" for maximum deflection of the H-19 meter. Without disturbing the setting of trimmer "2," retune trimmer "1" for maximum deflection of the H-19 meter.

Step 15. Repeat Step 14 for the third, second, and first i-f coupling units, in the order listed.

Step 16. Replace the knurled caps on the i-f coupling units. Remove the connections between the signal generator and the receiver and remove the short circuit from the antenna input connector.

R-f Alignment.

Step 1. Tune the signal generator to *exactly 131 mc* for the R-15 or *exactly 144 mc* for the R-19, 30 per cent modulated at 1000 cps, and connect its output through the 6-db attenuator to the receiver antenna input connector.

Step 2. Using Wrench ARC-10307, adjust the oscillator, second r-f amplifier, first r-f amplifier, and antenna trimmer capacitors, in the order listed, to produce maximum deflection of the H-19 meter. During the procedure, keep the H-19 meter reading below 2 volts by appropriate setting of the signal generator output.

Note

The oscillator trimmer adjustment is the most critical in the alignment. Hand capacity will detune the oscillator and lead to misadjustment. Take care to align this capacitor correctly.

A–10. R-15 AND R-19 RECEIVER TESTS.

Note

Before the following tests are made, the receiver must be properly aligned (refer to paragraph A–9); also, it must warm up for at least 15 minutes at rated low-voltage input with the D-10A Dynamotor operating. Prepare the test system as described in paragraph 2–4 and interconnect the units using Cable Harness Assembly ARC-19265 as shown in Figure 2–4.

High-dial Sensitivity.

Step 1. Connect a Ballantine Model 300 Electronic Voltmeter (10-volt scale) to the H-19 TEL jack.

Step 2. Rotate Knob ARC-18802 5.2 revolutions clockwise from its minimum-capacitance setting for the R-15, or 4.75 revolutions clockwise for the R-19.

Step 3. Connect the output of the Hewlett-Packard Model 608D Signal Generator through the Boonton Radio Corporation Type 505-B 6-db Attenuator to the antenna input connector on the receiver.

Step 4. Set the H-19 SENS control to its extreme clockwise position; the test meter switch may be in any position.

Step 5. Tune the signal generator, 30 per cent modulated at 1000 cps by the Hewlett-Packard Model 200AB Audio Oscillator, to resonance with the receiver.

Step 6. Adjust the signal generator output until the S+N/N ratio is 6-db (modulation on-off). The signal generator output should be 4 microvolts or less for the R-15, or 5 microvolts or less for the R-19.

Audio Output. With the conditions as they were for Step 6 of *High-dial Sensitivity,* the Ballantine Model 300 should read 1 volt or greater for the R-15, or 0.8 volt or greater for the R-19, when the signal generator modulation is on.

I-f Sensitivity at Mixer Grid.

Step 1. Using Test Probe ARC-16139, connect the output of the signal generator to the mixer-grid test jack.

Note

The output of the signal generator must be terminated in 47 ohms during this test.

Step 2. Tune the signal generator, 30 per cent modulated at 1000 cps, to resonance with the i-f amplifier (15 mc). Keep the Ballantine Model 300 reading below 2 volts during this adjustment by appropriate setting of the signal generator output.

Step 3. Adjust the signal generator output to produce a 1.73-volt reading (10 milliwatts into 300 ohms) on the Ballantine Model 300. The signal generator output should be between 80 and 300 microvolts.

Image Ratio.

Step 1. Connect the output of the signal generator, 30 per cent modulated at 1000 cps, through the 6-db attenuator to the antenna input connector on the receiver.

Step 2. For the R-15, tune the signal generator to 101 mc; for the R-19, tune to 114 mc.

Step 3. Adjust the signal generator output until the S+N/N ratio is 6-db (modulation on-off). The ratio between the signal generator output and the high-dial sensitivity should be 16,000:1 or greater for the R-15, or 11,000:1 or greater for the R-19.

Electrical and Mechanical Stability.

Step 1. Tune the signal generator to resonance with the R-15 (131 mc) or the R-19 (144 mc). Remove the signal generator modulation and increase the output to 0.2 volt.

Step 2. Rotate the knob and simultaneously explore the H-19 SENS control range while listening for motorboating, constant-pitch tones, or other unnatural noises, excluding "tweets."

Step 3. Set the signal generator output to 50 microvolts. Tap the chassis and tubes in the receiver while listening for microphonics and noise.

AVC Knee Output.

Step 1. Rotate the knob 5.2 revolutions clockwise from its minimum-capacitance setting for the R-15, or 4.75 revolutions clockwise for the R-19.

Step 2. Tune the signal generator, 30 per cent modulated at 1000 cps, to resonance with the receiver. Keep the reading of the Ballantine Model 300 below 1 volt during this adjustment by appropriate adjustment of the signal generator output.

Step 3. Set the H-19 test meter switch to CATHODE CURRENT 30 ma.

Step 4. Increase the signal generator output until the cathode current is reduced 1 ma. The Ballantine Model 300 should read between 6.4 and 11.5 volts.

AVC. With the signal generator tuned to resonance with the receiver, increase the signal generator output to 0.1 volt. The Ballantine Model 300 should read between 9 and 15 volts for the R-15, or between 9 and 14.5 volts for the R-19.

Overload. Increase the signal generator output to 0.2 volt. The Ballantine Model 300 should read less than 16.5 volts for the R-15, or less than 16 volts for the R-19, but not less than the related value read in Step 4 of *AVC Knee Output.*

Bandwidth, 1000:1 Down.

Step 1. Tune the signal generator to resonance with the receiver. Adjust the signal generator output to produce a 2-volt reading on the Ballantine Model 300.

Step 2. Increase the signal generator output 1000 times. Raise the signal generator frequency until the Ballantine Model 300 reads 2 volts. Note the signal generator frequency.

Step 3. Lower the signal generator frequency until the Ballantine Model 300 reads 2 volts. Note the signal generator frequency. The bandwidth for 1000:1 down is the difference between the signal generator frequencies and should be less than 380 kc.

Bandwidth, 2:1 Down.

Step 1. Tune the signal generator to resonance with the receiver. Adjust the signal generator output to produce a 2-volt reading on the Ballantine Model 300.

Step 2. Double the signal generator output. Raise the signal generator frequency until the Ballantine Model 300 reads 2 volts. Note the signal generator frequency.

Step 3. Lower the signal generator frequency until the Ballantine Model 300 reads 2 volts. Note the signal generator frequency. The bandwidth for 2:1 down is the difference between signal generator frequencies and should be greater than 60 kc.

Noise.

Step 1. Rotate the receiver SQUELCH control to its extreme counterclockwise position (maximum squelch).

Step 2. Set the signal generator output to minimum. The Ballantine Model 300 should read .01 volt or less.

Step 3. Rotate the H-19 SENS control to its extreme counterclockwise position. The Ballantine Model 300 should read .01 volt or less.

Audio Fidelity.

Step 1. Rotate the H-19 SENS control to its extreme clockwise position.

Step 2. Rotate the receiver SQUELCH control to its extreme clockwise position.

Step 3. Increase the signal generator output to 50 microvolts, 30 per cent modulated at 1000 cps.

Step 4. With the signal generator tuned to resonance with the receiver, adjust the H-19 SENS control to produce a 2-volt reading on the Ballantine Model 300.

Step 5. Change the signal generator modulation frequency to 400 cps. The Ballantine Model 300 should read between 1.2 and 1.6 volts.

Step 6. Change the signal generator modulation frequency to 5000 cps. The Ballantine Model 300 should read between 0.6 and 0.9 volt.

Mid-dial Calibration.

Step 1. Rotate the knob 15.14 revolutions clockwise from its minimum-capacitance setting for the R-15, or 14.97 revolutions clockwise for the R-19.

Step 2. Tune the signal generator, 30 per cent modulated at 1000 cps, to resonance with the receiver. Keep

the Ballantine Model 300 reading below 2 volts during this adjustment by appropriate adjustment of the signal generator output.

Step 3. Note the signal generator frequency. The calibration error is the difference between the signal generator frequency and 121 mc for the R-15 (133 mc for the R-19) and should be less than 150 kc.

Mid-dial Sensitivity. With the signal generator tuned to resonance with the receiver, adjust the signal generator output until the S+N/N ratio is 6-db (modulation-off). The signal generator output should be 3.8 microvolts or less for the R-15, or 4.5 microvolts or less for the R-19.

Low-dial Calibration.

Step 1. Rotate the knob 25.2 revolutions clockwise from its minimum-capacitance setting for the R-15, or 25 revolutions clockwise for the R-19.

Step 2. Tune the signal generator to resonance with the receiver. Keep the Ballantine Model 300 reading below 2 volts during this adjustment by appropriate adjustment of the signal generator output.

Step 3. Note the signal generator frequency. For the R-15, the calibration error is the difference between the signal generator frequency and 111 mc and should be less than 80 kc. For the R-19, the calibration error is the difference between the signal generator frequency and 122 mc and should be less than 105 kc.

Low-dial Sensitivity. With the signal generator tuned to resonance with the receiver, adjust the signal generator output until the S+N/N ratio is 6-db (modulation on-off). The signal generator output should be 3.5 microvolts or less for the R-15, or 4 microvolts or less for the R-19.

Squelch Sensitivity.

Step 1. Rotate the receiver SQUELCH control to its extreme counterclockwise position (maximum squelch).

Step 2. Adjust the signal generator output to produce a 1.73-volt reading on the Ballantine Model 300. The signal generator output should be less than 25 microvolts.

Low-dial Sensitivity, Reduced Voltage.

Step 1. Rotate the receiver SQUELCH control to its extreme clockwise position.

Step 2. Set the H-19 test meter switch to LV+ 30V.

Step 3. Adjust the primary power supply to produce a 22.5-volt (or 11.25-volt) reading on the H-19 meter.

Step 4. With the signal generator tuned to resonance with the receiver, adjust the signal generator output until the S+N/N ratio is 6-db (modulation on-off). The signal generator output should be 20 microvolts or less.

Oscillator Starting Voltage.

Step 1. Set the signal generator output to 500 microvolts.

Step 2. Reduce the primary power supply voltage just enough to stop oscillation.

Step 3. Wait 10 seconds, then gradually increase the primary power supply voltage until the oscillator starts. For the R-15, the H-19 meter should read 22.5 (or 11.3) volts or less when the oscillator starts; for the R-19, the reading should be 23.2 (or 11.6) volts or less.

Step 4. Replace the snapslide cover.

A–11. R-20 AND R-20A RECEIVER ALIGNMENT AND TEST.

Step 1. Remove the top dust cover from the R-20 or R-20A, then install the receiver in the test rack normally used to mount the transmitter.

Step 2. Install an R-10A, R-11A, R-15, or R-19 Receiver with dynamotor in the other test rack.

Step 3. Prepare the test system as described in paragraph 2–4, and interconnect the units using Cable Harness Assembly ARC-19270 and Cable Assembly ARC-20689 as shown in Figure 2–2.

Note

It is not necessary to install a K-13 Oscillator-Relay Unit in the test system; however, the dummy receptacles must be mated with the connectors to which they are attached to complete the high-voltage circuit.

Step 4. Set the H-19 test meter switch to LV+ 30V. Throw the LV+ switch ON, allow approximately three minutes for warm-up, then set the primary power source to produce a 27.5-volt (or 13.75-volt) reading on the H-19 test meter.

Step 5. Connect the output of a Hewlett-Packard Model 608D Signal Generator through a Boonton Radio Corporation Type 505-B 6-db Attenuator to the ANT connector on the front panel of the R-20 or R-20A.

Step 6. Set the signal generator to exactly 75 megacycles, 30 per cent modulated at 1300 cps by the Hewlett-Packard Model 200AB Audio Oscillator. (Use the signal generator internal crystal calibrator for accurate frequency determination.)

Step 7. Connect a Simpson Model 260 (50-volt dc scale) between the LAMP test jacks on Cable Assembly ARC-20689.

Step 8. Connect a Ballantine Model 300 (10-volt scale) between the TEL test jacks on Cable Assembly ARC-20689. A headset may be connected to the PHONES jack on Cable Assembly ARC-20689 if desired.

Step 9. Set the R-20 or R-20A sensitivity control, R2717, to approximately mid position.

Step 10. Starting with L2706 of Z2703, individually adjust the six r-f tuned circuits, in reverse sequence, for maximum audio output, adjusting the signal generator output to produce between 1 and 2 volts audio output from the receiver, as observed on the Ballantine Model 300.

Step 11. Set the signal generator output to 1400 microvolts (or to the desired sensitivity value) and adjust R2717 to the point at which relay K2701 first operates. The Simpson Model 260 will read 27.5 volts (or 13.75 volts) when K2701 is energized.

Step 12. Detune L2705 by turning the slug all the way down. Tune L2706 for maximum output; then retune L2705 for maximum output.

Step 13. Detune L2703 by turning the slug all the way down. Tune L2704 for maximum output; then retune L2703 for maximum output.

Step 14. Detune L2701 by turning the slug all the way down. Tune L2702 for maximum output; then retune L2701 for maximum output.

Note

For Steps 13, 14, and 15, keep the signal generator output at a level to produce between 1 and 2 volts audio output as observed on the Ballantine Model 300.

Step 15. Increase the signal generator output until relay K2701 just closes, as indicated on the Simpson Model 260. The signal generator output attenuator should read 1400($\pm$50) microvolts, or the selected sensitivity value. If the reading is incorrect, repeat Steps 12 through 16 until this setting is obtained.

Step 16. Lock R2717, taking care not to disturb its setting.

Step 17. Replace the top dust cover.

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